Remediation Services
of Louisiana, Inc.
Liquid Waste Technologies

REMEDIATION SERVICES OF LOUISIANA

LOUISIANA DEPARTMENT OF ENVIRONMENTAL QUALITY

SOLID WASTE PERMITS

BENEFICIAL-USE

PERMIT APPLICATION RENEWAL

JANUARY 23, 2008

Submitted By: Brian R. Helms, P.E.

1225 Neosho Avenue, Baton Rouge, Louisiana 70802
(~~504~~ 225) 389-0804 Fax (~~504~~ 225) 389-0065 1(800) 828-1081

PUBLIC NOTICE
LOUISIANA DEPARTMENT OF ENVIRONMENTAL QUALITY (LDEQ)
REMEDIATION SERVICES OF LOUISIANA / RSL ACQUISITION COMPANY, LLC
SOLID WASTE BENEFICIAL USE PLAN

The LDEQ, Office of Environmental Services, has determined that the solid waste beneficial use plan for RSL Acquisition Company LLC, 1225 Neosho Ave, Baton Rouge, LA 70802 for the Remediation Services of Louisiana is acceptable for public review. **The facility is located at 1225 Neosho Ave, Baton Rouge, East Baton Rouge Parish.**

RSL Acquisition Company requested to renew the solid waste beneficial use plan. The facility utilizes product that is recaptured organic material separated during grease trap waste recycling operations. This organic by-product is injection into grass pastures as a crop nutirent and as a soil conditioner.

Written comments, written requests for a public hearing or written requests for notification of the final decision regarding this action may be submitted to Ms. Soumaya Ghosn at LDEQ, Public Participation Group, P.O. Box 4313, Baton Rouge, LA 70821-4313. **Written comments and/or written requests must be received by 12:30 p.m., Wednesday, June 11, 2008.** Written comments will be considered prior to a final decision.

If LDEQ finds a significant degree of public interest, a public hearing will be held. LDEQ will send notification of the final decision to the applicant and to each person who has submitted written comments or a written request for notification of the final decision.

The solid waste beneficial use plan is available for review at the LDEQ Public Records Center, Room 127, 602 North 5th Street, Baton Rouge, LA. Viewing hours are from 8:00 a.m. to 4:30 p.m., Monday through Friday (except holidays). **The available information can also be accessed electronically on the Electronic Document Management System (EDMS) on the DEQ public website at www.deq.louisiana.gov**.

Additional copies may be reviewed at East Baton Rouge Parish Library, Scotlandville Branch, 7373 Scenic Highway, Baton Rouge, LA, City of Baton Rouge Mayor's Office, 222 St. Louis Street, 3rd Floor, Baton Rouge, LA.

Inquiries or requests for additional information regarding this matter should be directed to Jodie L. Alexis, LDEQ, Waste Permits Division, P.O. Box 4313, Baton Rouge, LA 70821-4313, phone (225) 219-3089.

Persons wishing to be included on the LDEQ permit public notice mailing list or for other public participation related questions should contact the Public Participation Group in writing at LDEQ, P.O. Box 4313, Baton Rouge, LA 70821-4313, by email at deqmaillistrequest@la.gov or contact the LDEQ Customer Service Center at (225) 219-LDEQ (219-5337).

Public notices including electronic access to general information from the solid waste beneficial use plan can be viewed at the LDEQ permits public notice webpage at www.deq.louisiana.gov/apps/pubNotice/default.asp and general information related to the public participation in permitting activities can be viewed at www.deq.louisiana.gov/portal/tabid/2198/Default.aspx.

Alternatively, individuals may elect to receive the permit public notices via email by subscribing to the LDEQ permits public notice List Server at www.doa.louisiana.gov/oes/listservpage/ldeq_pn_listserv.htm

All correspondence should specify AI Number 38086, Permit Number P-0304 and Activity Number PER20060001.

Publication date: May 8, 2008

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04/21/08

BOBBY JINDAL
GOVERNOR

HAROLD LEGGETT, PH.D.
SECRETARY

State of Louisiana

DEPARTMENT OF ENVIRONMENTAL QUALITY
ENVIRONMENTAL SERVICES

APR 10 2008

Certified Mail 7003 2260 0005 9324 2214

Mr. Brian R. Helms, P.E.
Remediation Services of Louisiana
1225 Neosho Avenue
Baton Rouge, LA 70802

RE: Public Notice Notification
Solid Waste Beneficial Use Plan
AI# 38086/GTD-033-4890/P-0304
East Baton Rouge Parish PER20060001

Dear Mr. Helms:

We are in receipt of the finalized copies of your permit application dated January 23, 2008, and the additional information package dated March 26, 2008. The additional information submitted separately has been inserted into the final copy of your Beneficial Use Plan. After review of these documents, we have determined that your submittal is complete and prepared for public review.

The Environmental Assistance Division will distribute copies of your plan for public review and place public notices in the appropriate newspapers in accordance with LAC 33:VII.513.F.3. Please contact Ms. Soumaya Ghosn at (225) 219-3276 for the date of publication and the dates for the comment period. At the conclusion of the comment period, we will consider all comments and render a decision regarding your Beneficial Use Plan.

Post Office Box 4313 • Baton Rouge, Louisiana 70821-4313 • Phone 225-219-3181 • Fax 225-219-3309
www.deq.louisiana.gov

Please continue to reference your Agency Interest (AI# 38086), Permit Activity Number (PER20060001), and Facility Identification Number (GTD-033-4890) on all future correspondence regarding this matter. If you have any questions, please contact Jodie Alexis of the Solid Waste Permits Division at (225) 219-3089.

Sincerely,

Bijan Sharafkhani, P.E.
Administrator
Waste Permits Division

jla

BENEFICIAL USE PERMIT APPLICATION
(RENEWAL)

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COPY

original to IOSW

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copy to SW/G3/Thomas

AVG

PER20060001

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JAN 28 2008

WASTE PERMITS DIVISION
SOLID & HAZARDOUS WASTE SECTION

Remediation Services of Louisiana, Inc.

Liquid Waste Technologies

January 23, 2008

Dr. Hal Leggett
Louisiana Department of Environmental Quality
Office of Environmental Services
P.O. Box 4313
Baton Rouge, LA. 70821-4313

RE: Beneficial Use Permit Application Renewal
AI#38086 GTD-033-4890 / P-0304

Dear Sir,

Pursuant to LA DEQ's Title 33 - Environmental Quality - Part VII . Solid Waste, Subpart 1. Solid Waste Regulations Chapter 11, Beneficial Use Facilities, Section 1105, and incorporating the changes in the revised Solid Waste Rules and Regulations presented to us in meeting with Bijan Sharafkhani, P.E. and other DEQ personnel on October 26, 2007, Remediation Services of Louisiana (RSL Acquisition Company LLC) hereby submits to the Administrative Authority an Application for a renewal of our Beneficial Use Permit.

This program has been very successful and allowed the recapture and highly beneficial reuse of processed food scraps recovered from restaurant grease trap waste in conjunction with our Type II-A Process Facility in Baton Rouge. We at RSL as well as the landowners / cattle ranchers that we partner with are excited about the opportunity to continue to enhance pasture land for many years to come.

We will be available to discuss any aspect of this permit application and look forward to a timely issuance of a new Beneficial Use Permit.

Very Truly Yours,

Brian R. Helms, P.E.

RECEIVED

JAN 25 2008

LDEQ

1225 Neosho Avenue, Baton Rouge, Louisiana 70802
(~~504~~ 225) 389-0804 Fax (~~504~~ 225) 389-0065 1(800) 828-1081

A. APPLICATION DOCUMENTATION

1. NAME, ADDRESS, and TELEPHONE NUMBER of APPLICANT

Remediation Services of Louisiana
RSL Acquisition Company LLC
1225 Neosho Ave
Baton Rouge, LA. 70802
225-389-0804
225-389-0061 (FAX)

2. NAME, ADDRESS, and TELEPHONE NUMBER of PRIMARY CONTACT

Brian R. Helms, P.E.
Remediation Services of Louisiana
1225 Neosho Ave.
Baton Rouge, LA. 70802
225-389-0804
225-389-0061 (FAX)

3. SITE OF ORIGIN of SOLID WASTE

Remediation Services of Louisiana
1225 Neosho Ave.
Baton Rouge, LA. 70802

State of Louisiana

Department of Environmental Quality

M.J. "MIKE" FOSTER, JR.
GOVERNOR

june 1, 1996

J. DALE GIVENS
SECRETARY

CERTIFIED MAIL Z 442 016 641
RETURN RECEIPT REQUESTED

Mr. Richard W. Lancaster
Remediation Services of Louisiana, Inc.
3129 Edenborn Avenue, Suite #100
Metairie, Louisiana 70002-6404

RE: Issuance of Standard Permit
Remediation Services of Louisiana, Inc.
Beneficial-Use Permit
GTD-033-4890/P-0304
East Baton Rouge Parish

Dear Mr. Lancaster:

Under the authority of the Louisiana Environmental Quality Act (La. R. S. 30:2001 et seq.), I hereby issue the enclosed Standard Beneficial-Use Permit for the above-referenced facility.

Upon meeting the required conditions for the grease trap waste and all site restrictions governing the land application of the material, a qualified professional must certify that the facility, as it exists, is consistent with the representations made in the permit application and conditions of the Standard Permit.

Upon receipt of the Standard Permit, completion of construction measures and certification by a registered engineer, licensed in the State of Louisiana, an initial start-up inspection will be conducted by the Solid Waste Division. All start-up inspections shall be initiated within ten (10) working days of receipt of certification by the Solid Waste Division.

Please note that in accordance with LAC 33:VII.509.C.4, within fifteen (15) working days after the start-up inspection, the Solid Waste Division will issue an order authorizing commencement of operation or a written Notice of Deficiency to the permittee. Also, an Order to Commence Operations must be obtained from the Department prior to the commencement of operations of new features constructed as part of the facility upgrade.

This permit action shall become final and not subject to further administrative review unless, no later than thirty (30) days after receipt of this document, you file a written request for a hearing. This request should be directed to the following

Administrative Hearings Clerk
Administrative Hearings Division
Office of the Secretary
Department of Environmental Quality
Post Office Box 82263
Baton Rouge, Louisiana 70884-2263

A copy of this request should be sent to the Solid Waste Division.

In accordance with LAC 33:VII.513.H., the permit holder shall publish a notice of the issuance of the standard permit no later than ten (10) days following the issuance of the permit. This notice shall be published in the official journal of the state and in the official journal of the parish where the facility is located.

If you have any questions concerning this matter, please contact Ms. Yolunda Righteous of the Solid Waste Division at (504) 765-0249.

Sincerely,

J. Dale Givens
Secretary

JDG:YR:jd

Enclosure

STANDARD BENEFICIAL-USE PERMIT

Site Number: D-033-4890 Standard Permit Number P-0304

Pursuant to the Louisiana Environmental Quality Act (La. R. S. 30:2001 et seq.; "the Act") as amended, and the Louisiana Administrative Code, title 33, Part VII, a Standard Beneficial-Use Permit is issued to:

Remediation Services of Louisiana, Inc.
Beneficial-Use of Grease Trap Material
3129 Edenborn Avenue
New Orleans, Louisiana 70002-6404

(hereinafter referred to as the "Permittee")

Limitation and conditions applicable to this Standard Permit:

1. This Standard Permit applies only to the application site referred to in the permit application (hereinafter referred to as the "Facility"), located at 1225 Neosho Avenue in East Baton Rouge Parish.

2. Upon meeting the required conditions for the grease trap waste and all site restrictions governing the land application of the material, a qualified professional must certify that the facility, as it exists, is consistent with the representations made in the permit application and conditions of the Standard Permit.

3. The grease trap material applied on land shall contain no more than 2% free oil and grease by volume and no more than 4% total oil and grease by volume.

4. The Permittee shall notify the Division prior to commencement of operation of new features constructed as part of the upgrading of the Facility so that an inspection can be made in accordance with LAC 33:VII.509.C.2.

5. The operation of the Facility is subject to all applicable rules and regulations and orders of the Solid Waste Division now and hereafter in effect.

The operation of the Facility shall be in accordance with the representations made in the permit application accepted by the Solid Waste Division and all condition of this Standard Permit.

7. The estimated date of final closure of the Facility as provided in LAC 33:VII.1107.G of the permit application is to be used for the purpose of projecting the Facility's potential capacity. This Standard Permit expires June 1, 2006. A new permit application shall be submitted at least 455 days before the expiration date of the Standard Permit, unless permission for later filing is granted by the administrative authority. Otherwise, the facility shall be closed in accordance with the closure plan outlined in the permit application.

8. During the closure period the Permittee must continue to comply with any prohibitions or conditions concerning growth of food-chain and non-food-chain crops.

9. No modifications to the facility or operation may be effected without prior approval of the Secretary in accordance with LAC 33:VII.517.A.

10. Failure to operate the Facility in accordance with the Act, the Louisiana Administrative Code, Title 33, Part VII, or this Standard Permit shall constitute a violation which will subject the Permittee to the possible imposition of civil penalties in accordance with LAC 33:VII. Chapter 9 and Section 2025 of the Act; and to the possible suspension or revocation of this Standard Permit in accordance with LAC 33:VII.511.H.

J. Dale Givens, Secretary
Department of Environmental Quality

6/1/96
Date of Issuance

4. CHARACTERISTICS OF THE MATERIAL

All product applied at the Beneficial Use facility will originate as the recaptured organic material separated during grease trap waste recycling operations. It is gray brown in color and typically has the consistency of barbecue sauce. It is composed of the filtered solid food matter used in various cooking processes for human consumption. Primary components include water, flour, corn meal and various food scraps. The following Analytical and Environmental Testing, Inc. chemical analysis provides analytical data and the attached Louisiana State University study provides additional chemical description. It must be remembered that all products used in this application are recovered and filtered food products prepared for human consumption. The suitability for legitimate Beneficial Use was extensively studied by LSU, approved by the DEQ and successfully implemented for eleven years.

The Analytical and Environmental Testing Inc. chemical analysis is based on material samples taken directly from the beneficial use material loading point from the RSL Facility. The material was transported by Analytical and Environmental Testing personnel and tested at the 1717 Seaboard Drive location to determine the concentration in the raw sample of the desired parameters utilizing the test methods and quality control procedures identified. The reader is advised that pages 5 and 6 of this report is the Quality Control Report used to verify the validity of the tested sample data depicted on pages 3 and 4. Again results depicted on pages 5 and 6 are not of the Beneficial Use material. The test results summary states that all results are within RCRA regulatory limits. The LSU Agronomy Department studies states that " no adverse effects of using this by-product as a source of crop nutrients and as a soil conditioner were evident" and that "injection of this slurried organic by-product into bahia grass pasture significantly increased yields and hay quality".

5. QUANTITY, QUALITY and SOURCE of SOLID WASTE

The Beneficial Use Facility will be operated as an extension of the RSL's Type II-A facility in Baton Rouge. All product applied at the proposed Beneficial Use Facility will originate as the recaptured organic material separated during grease trap waste recycling operations. It must be remembered that all products used in this application are recovered and filtered food products prepared for human consumption. The product profile of this stream has been thoroughly examined in preparation for our Beneficial Use Permit Application (submitted February 08, 1996) and approved by the LA DEQ. The consistent volume of grease trap waste handled at the Baton Rouge Facility (500,000 gal/mo.) allows the organic material to be homogeneous and consistent.

- The receipt of hazardous waste shall be strictly prohibited and prevented.
- Only waste with a demonstrated beneficial use will be applied.
- The grease trap waste accepted at the Baton Rouge Type II-A facility is subjected to be tested and manifesting required for its Type II-A Permit. RSL certifies that the material to be beneficially applied will contain no more than 2% free oil and grease by volume and no more than 4% total oil and grease by volume.

6. PROCESS DESCRIPTION

1. TYPES & QUANTITIES of WASTE (521.H.1.a)

The proposed facility will only accept properly manifested grease trap waste. We anticipate that the facility as currently designed should be able to process 600,000 gallons per month. Of course market conditions determine the actual quantity processed in a given month.

Grease trap waste is a non-toxic, non-hazardous "Special Waste," as defined in 31 Texas Administrative Code 330.2 (Louisiana has no similar classification). It is collected in restaurants, schools, prisons, hospitals, nursing homes, military bases, as well as in commercial food processing plants. It is generally described as having three components; contaminated or "gray" water, top cake, and bottom solids or sediment.

Contaminated gray water is 50-60% of the total waste stream by volume, if the traps are pumped on a quarterly cycle, fully emptied, and cleaned to the bottom. As it is pumped from a restaurant grease trap by a vacuum truck operator, gray water will contain on average 2,500 milligrams of oil and grease/liter (O&G mg/l or PPM), a COD (Chemical Oxygen Demand) of 15,200, a BOD (Biological Oxygen Demand) of 36,500, a TSS (Total Suspended Solids) of 3,600, and a pH of 4.0. These numbers may vary somewhat depending upon the kind of operation or food prepared and the frequency with which the trap is pumped.

Although calling it "water" makes this element of the grease trap waste stream sound harmless, gray water is exactly the kind of "Special Waste" that the new National Pretreatment Standards are designed to keep out of the POTW systems. Gray water is a commercial effluent with an acidic pH that will corrode the sewage collection system and enough dissolved grease to accumulate in slow-moving sections and lift stations and interfere with the proper operation of POTWs. Under 40 CFR 403.5(b)(2),(3), and (4) POTWs are not permitted to accept into their systems a Special Waste such as gray water from a grease trap.

Top cake is the raw grease waste that has floated to the top of the grease trap and coagulated there. It is 20-30% of a vacuum truck's load, if he has emptied the grease traps he services completely ("100% pump-out") and on a quarterly cycle. If a pumper merely skims the trap, or the trap has not been emptied for six months or longer, then 80% or more of the contents extracted will be top cake. Top cake is 60-70% oil and grease, the rest being mostly lighter organic wastes such as flour. The COD of top cake is usually about 300,000, BOD is 50,000, TSS is 25,000, and the pH is 4.0-4.2.

Organic and inorganic solids (food wastes, grit and sand, rubber gloves, bottle caps) constitute the bottom layer pumped from a grease trap. Settleable bottom solids typically constitute 10-15% of the volume collected in a regularly cleaned grease trap, but in a situation where a trap has not been pumped out regularly the trap can be filled with solids, often in a septic condition. This defeats the purpose of the interceptor and allows high concentrations of O&G and suspended solids to pass through the grease trap and into the sewer without the retention time required for mechanical separation.

a. Hazardous Waste

The receipt of hazardous waste shall be strictly prohibited and prevented.

b. Burning of Waste

Burning of waste shall be strictly prohibited.

c. Salvaging of Waste

Salvaging of waste as opposed to segregation of waste shall be prevented.

d. Scavenging of Waste

Scavenging of waste shall be prevented.

e. Receipt of Mercury & Cadmium

The receipt of mercury and/or cadmium-bearing batteries shall be strictly prohibited and prevented.

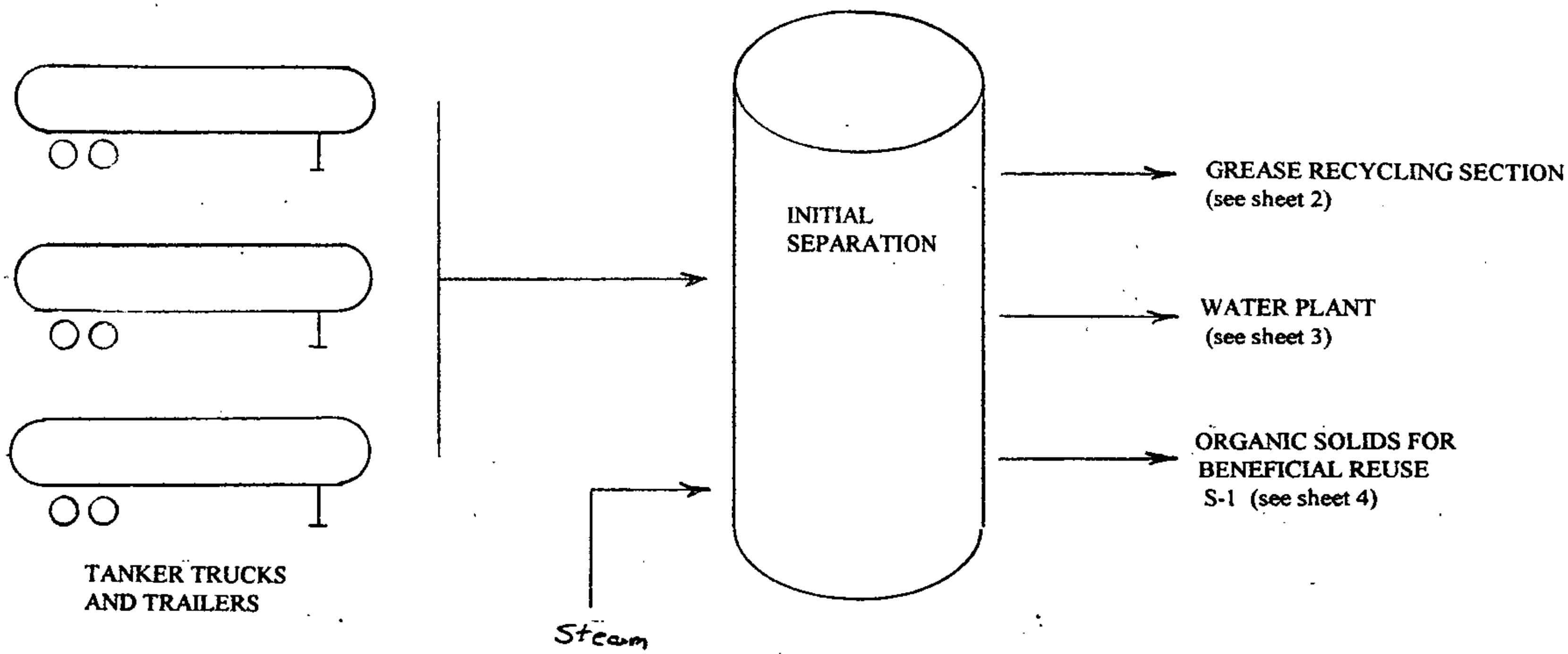
2. OPERATIONAL PROCEDURES (521.H.1.b)

The RSL Baton Rouge Plant accepts only manifested grease trap waste for processing. Products are sampled and tested for the presence of hydrocarbons before acceptance. The initial step of the process is to begin to separate the grease trap waste into its three components; topcake, gray water and organic solids. Topcake is the grease and animal fats accumulated as a waste product in the cooking process. Gray water is the contaminated water which should represent the largest component of the raw product. The organic solids which include flour, cornmeal, rice, etc., are dumped into greasetraps along with the cooking residue of fats and oils. The process uses heat, mechanical and chemical separation to extract all the usable grease from the topcake and solids. Bioremediation is used to destroy the grease still dissolved in the gray water. The organics are filtered, blended and moisture adjusted to permit their land application as a "Beneficial Use Organic Soil Enhancement".

The plant is built as a permanent processing facility utilizing designed foundations, welded steel tanks, permanent industrial pumps, welded steel piping, and NEMA electrical power and control circuits.

The flow charts on the following pages graphically depict the process.

RSA's PROCESS FOR GREASE TRAP WASTE REMEDIATION & RECYCLING



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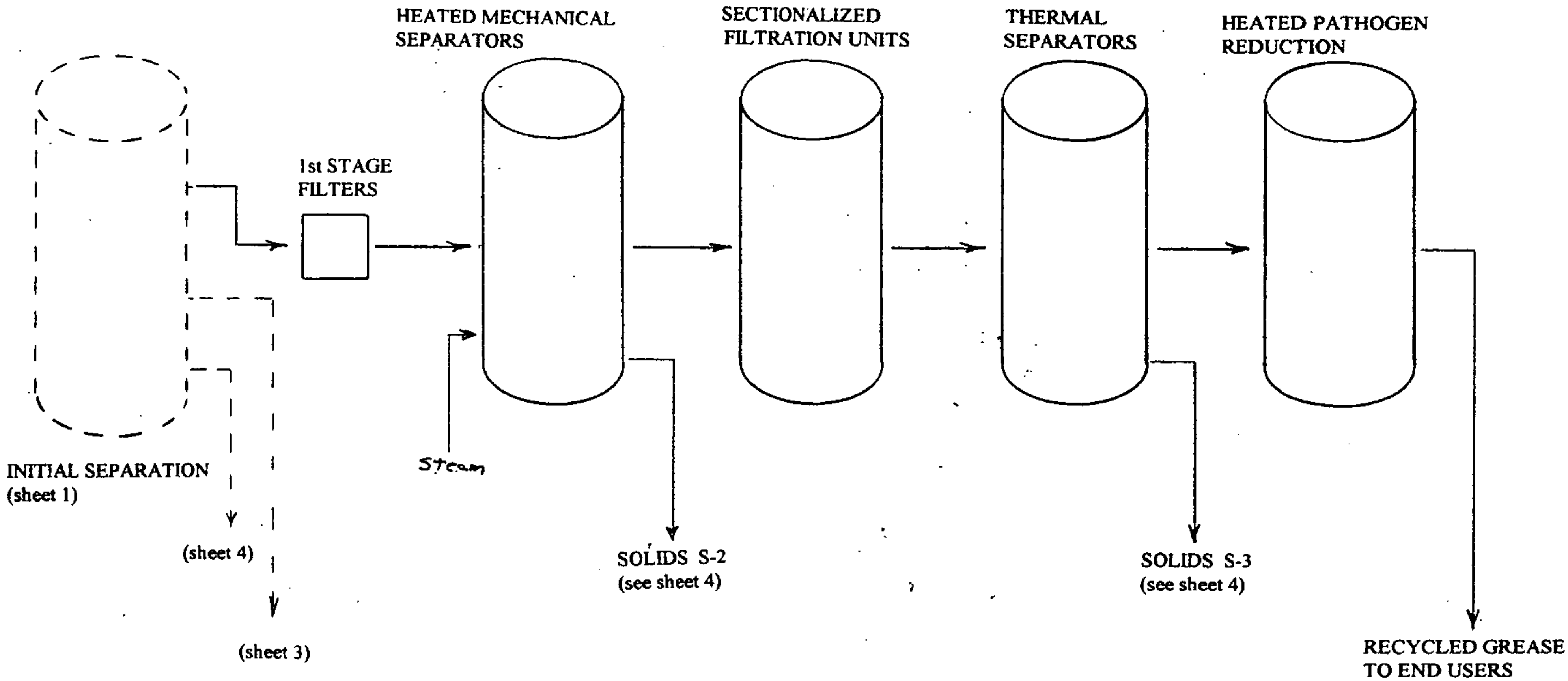
12, Sept. 1994

RSA GREASE RECYCLING SECTION



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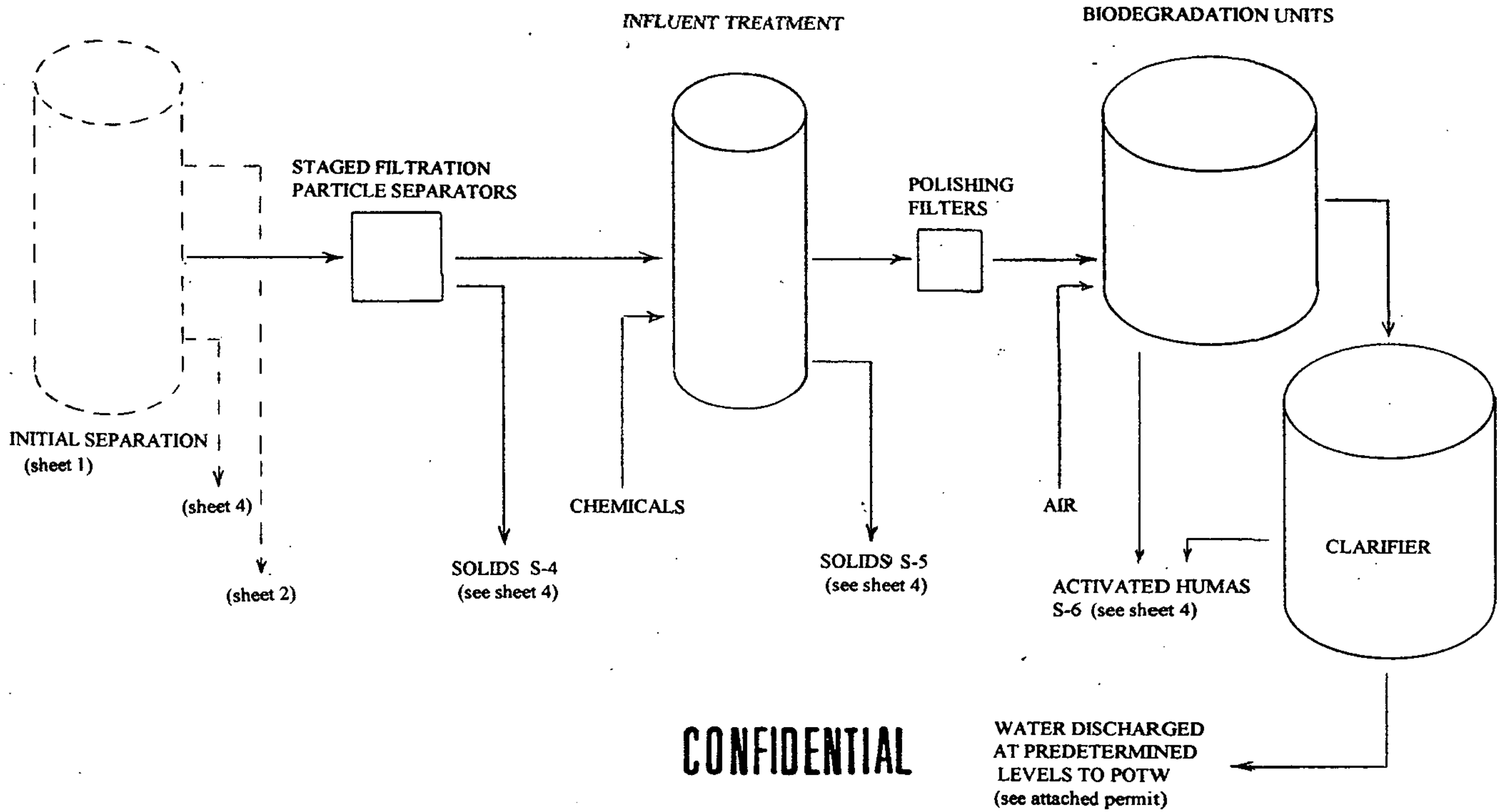
RSA WATER PLANT



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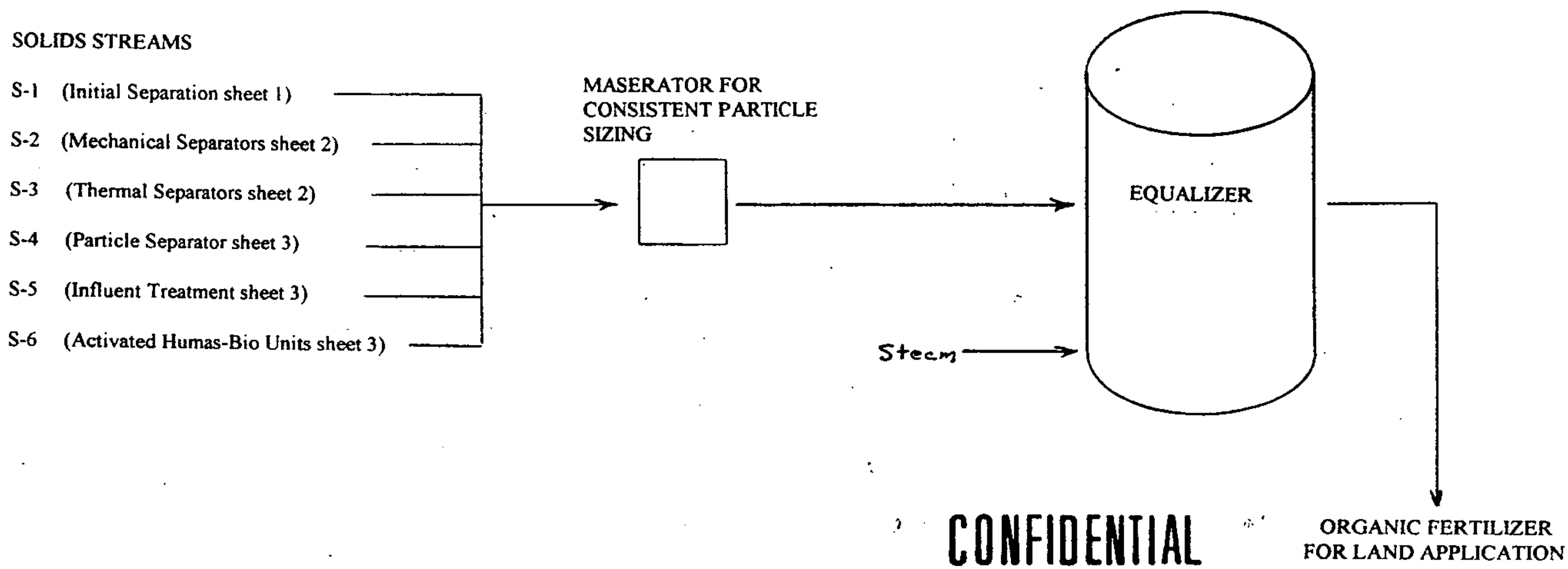
12, Sept. 1994

RSA BYPRODUCT SOLIDS FOR BENEFICAL REUSE



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12, Sept. 1994

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3. SCHEDULE OF EQUIPMENT (521.H.1.c)

NAME	DESCRIPTION
Boiler 1	350 HP York Shipley Natural Gas Firetube High Pressure Boiler
Condensate Tank	500 gal Welded Steel Tank for Boiler Feed Water
Boiler Feed Pump	15 HP 2" Vertical Centrifugal Aurora Model 314 Pump
Chemical Tank	60 gal Plastic Tank for Boiler Feed Water Chemical
Chemical Pump	1/2 HP 1/4" Piston Pump for Boiler Feed Chemical
Air Compressor 1	Gardner-Denver 20 HP 25 psi Two Cylinder Air Compressor
Air Compressor 2	Cambell Housfeld 5 HP 120 psi Single Cylinder
Vacuum Filter 1	250 gal Raw Product Filter Vessel for Truck Unloading
Vacuum Filter 2	750 gal Raw Product Filter Vessel for Truck Unloading
Unloading Pump	6" Nemo Progressing Cavity Pump 7.5 HP 120 gpm
Separation Tank (S-1)	20,000 gal Cone Bottom Vertical Welded Steel Tank
Separation Tank (S-2)	20,000 gal Cone Bottom Vertical Welded Steel Tank
Separation Tank (S-3)	22,000 gal Cone Bottom Vertical Welded Steel Tank
Separation Tank (S-4)	22,000 gal Cone Bottom Vertical Welded Steel Tank
Separation Tank (S-5)	22,000 gal Cone Bottom Vertical Welded Steel Tank
Product Transfer Pump	4" Nemo Progressing Cavity Pump 5 HP 100 gpm

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Heated Separator (PHT-1)	8500 gal Horizontal Steel Liquid Heat Exchanger
Heated Separator (PHT-2)	16,000 gal Horizontal Steel Heat Exchanger with Hoppers
Greasy Solids Pump	4" Nemo Progressing Cavity Pump 5 HP 100 gpm
Sectionalized Filter (T-1)	4500 gal Horizontal Steel Heat Exchanger with Wiers
Sectionalized Filter (T-2)	4500 gal Horizontal Steel Heat Exchanger with Wiers
Sectionalized Filter (T-3)	5300 gal Horizontal Steel Heat Exchanger with Wiers
Sectionalized Filter (T-4)	5300 gal Horizontal Steel Heat Exchanger with Wiers
Thermal Separator (C-1)	16,000 gal Cone Bottom Heated Vertical Welded Steel Tank
Grease Storage Tank (H-1)	11,000 gal Heated Vertical Steel Tank with Mixers
Grease Storage Tank (H-2)	11,000 gal Heated Vertical Steel Tank with Mixers
Water Storage Tank (W-1)	8000 gal Fiberglass Potable Washdown Water Storage Tank
Water Storage Tank (W-2)	8000 gal Fiberglass Potable Washdown Water Storage Tank
Wash Water Pump	5 HP Gould 1.5 " Centrifugal 60 psi Water Pump
Grease Filter	Vertical Filter Vessel 6"X 30" Filtration Systems Model 4527
Grease Pump 1	2" Monarch Centrifugal Pump 2 HP 100 gpm
Grease Pump 2	2" Nemo Progressing Cavity Pump 2 HP 35 gpm
Grease Pump 3	2" Peerless Centrifugal Pump High Temp 7.5 HP 150 gpm
Particle Separator (WB-1)	2400 gal Steel Water Filtration Unit 2 Sections 20'X 4'X 4'

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Gray Water Pump 1	2" Monarch Nonemulsifying Centrifugal Pump 2 HP 35 gpm
Gray Water Pump 2	2" Monarch Monemulsifying Centrifugal Pump 2 HP 35 gpm
Influent Treatment (R-1)	12,500 gal Cone Bottom Vertical Welded Steel Tank
Influent Treatment (R-2)	15,000 gal Cone Bottom Vertical Welded Steel Tank
Influent Treatment (R-3)	22,000 gal Cone Bottom Vertical Welded Steel Tank
Floculation Solids Pump	3" C H & E Single Diaphram Pump 2 HP 30 gpm
Primer Water Pump	2" Centrifugal Pump 7.5 HP used to Prime Process Water Filters
Process Water Filter 1	Vertical Filter Vessel 18"X 30" I S P Filter RB-3-02L
Process Water Filter 2	Vertical Filter Vessel 18"X 30" I S P Filter RB-3-02L
Process Water Pump	4" ITT Marlow Centrifugal Pump 15 HP 400 gpm
Primary Digestor (A-1)	63,000 gal Vertical Bolted Tank with USI Aeration System
Primary Digestor (A-2)	63,000 gal Vertical Bolted Tank with USI Aeration System
Future Clarifier (B-1)	210,000 gal Vertical Bolted Tank (not in service)
Polishing Clarifier (B-2)	210,000 gal Vertical Bolted Tank with Diffused Air System
Caustic Tank 1	850 gal Plastic Vertical Tank Stores Flocking Agent
Caustic Tank 2	850 gal Plastic Vertical Tank Stores Flocking Agent
Caustic Pump	1/2" Double Diaphram Air Driven Pump for Caustic Transfer
Blower 1	40 HP MD Pneumatics Roots Style Process Air Blower

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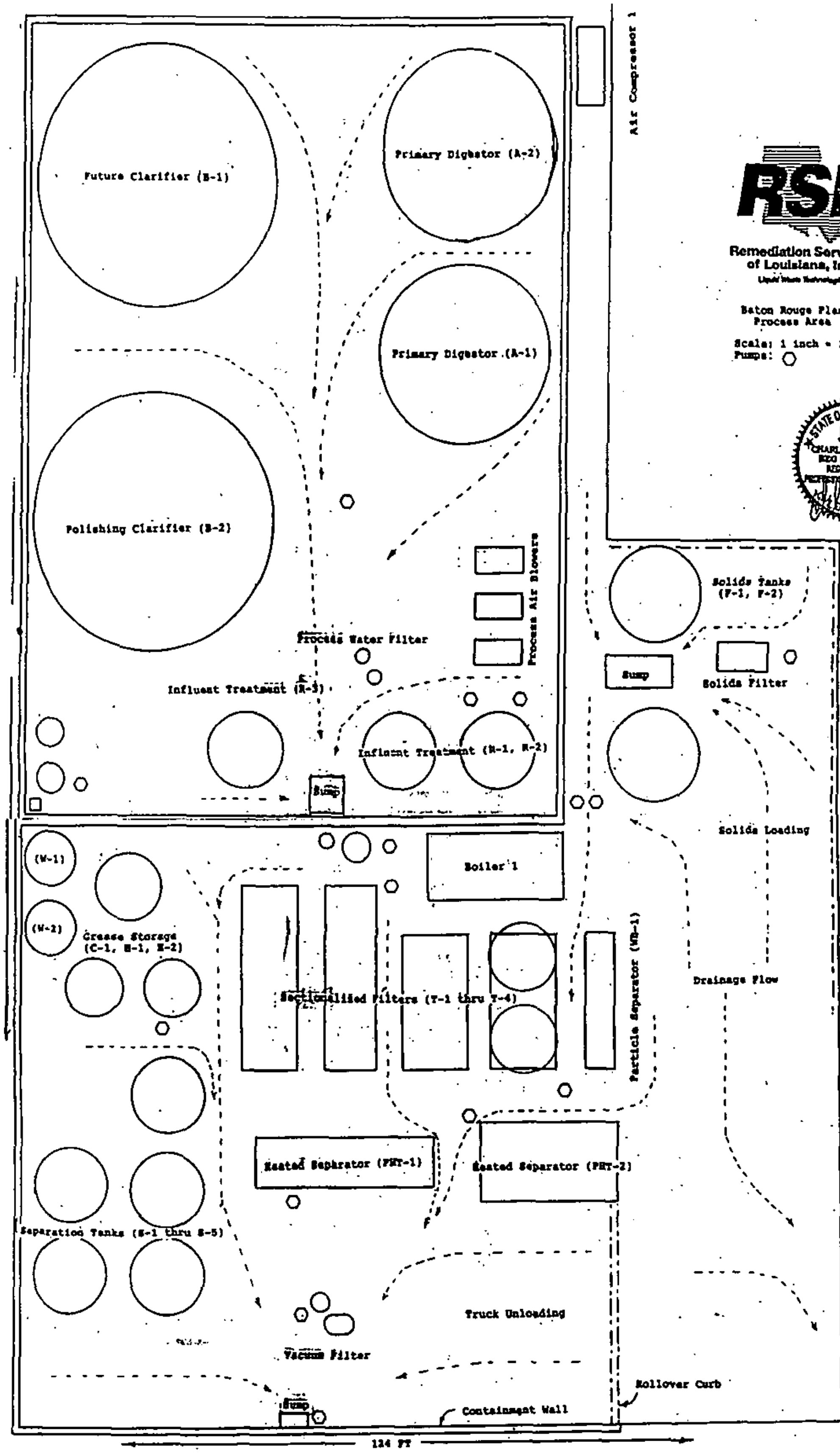
Blower 2	40 HP MD Pneumatics Roots Style Process Air Blower
Blower 3	25 HP Sutorbilt Roots Style Process Air Blower
Cooling Tower	80 cuft Air/Water Exchanger with 1 HP Fan
Circulation Pump 1	1.5" Centrifugal Pump 1 HP Circulates Cooling Water
Circulation Pump 2	1.5" Centrifugal Pump 1 HP Circulates Cooling Water
Solids Tank (F-1)	21,000 gal Cone Bottom Vertical Welded Steel Tank
Solids Tank (F-2)	21,000 gal Cone Bottom Vertical Welded Steel Tank
Solids Filtration (SB-1)	840 gal Steel Beneficial Use Solids Particle Filter
Solids Loading Pump	4" Nemo Progressing Cavity Pump 5 HP (30-120 gpm)

In addition to the above permanent plant equipment the following are maintained on site to serve as backup pumps should there be an equipment malfunction or to expedite dewatering during periods of heavy rain. All are portable on wheels and either utilize a 220 volt extension chord for power or have an attached gasoline engine. The pressure washers are used primarily to clean the exterior of the tanker trailers.

4" Diaphram Pumps (3 each)	C H & E single diaphram pumps deliver 40 gpm and are fitted with Cam-lock fittings. Two are electricly driven and one has a gasoline engine.
3" Diaphram Pumps (5 each)	C H & E single diaphram pumps deliver 30 gpm and are fitted with Cam-lock fittings. All are electrically driven.
2" Peristaltic Pump (1 each)	Amflow Series M with 5 HP gasoline engine can pump up to 100 gpm.
Pressure Washer (2 each)	Landa 11 HP model with kerosine heater has nozzle pressure of 2100 psi at 200 deg F.



RSL

Remediation Services of Louisiana, Inc.

Liquid Waste Technologies

Baton Rouge Plant
Process Area

Scale: 1 inch = 10 ft.
Pumps: ○

STATE OF LOUISIANA
CHARLES LADNER
REG No. 18358
REGISTERED
PROFESSIONAL ENGINEER

7. PROCESS TO MAKE PRODUCT SUITABLE FOR BENEFICIAL USE

The Beneficial Use Material is the organic material (and some water for pumpability) that comes off the bottom of several of the RSL grease trap waste processing operations. This material is put into two 22,000 gallon cone bottom tanks for final clarification. For cold weather operation steam can be injected into the bottom to carry any residual grease to the top for removal. When ready for loading into the tanker trailers, the product is allowed to flow through an open filter vessel vessel which will remove any stray material. An operator monitors this operation one hundred percent of the time, this allows for a final visual inspection of the product as it is being loaded into the trailers.

8. DEMONSTRATION OF PRODUCT MARKET

The Beneficial Use Material is used to increase the fertility of land for agricultural purposes. Scientific studies performed by The Louisiana State University Agronomy Department show that pasture land biomass yields increase by up to a factor of five. The following Section 1105 Part 1 applications identifiy the current ranch land owners who want the material applied to their land. Through word of mouth, many other land owners have expressed interest in being considered for future applications.

We currently do not charge land owners for this service. If in the future our volumes of beneficial use material were to increase substantially, we might look into the economic viability of charging a fee for this service. Given the current value of a roll bale of hay; about $25. the dollar value to the land owner for the increased hay yields are certainly recognized but are not hugely significant for small "hobby" cattle ranchers. The material is subsurface injected into pasture land and has been shown to increase hay production from a typical 2 bales per acre per year to up to 10 bales per acre per year.

2. SECTION 1105 APPLICATION FORM - PART 1

SOLID WASTE STANDARD PERMIT APPLICATION FOR
BENEFICIAL - USE FACILITIES - PART 1

A. Applicant (Permit Holder): Remediation Services of Louisiana
Name of Property Owner: Wilmer R. Mills

B. Facility Name: Home Place

C. Facility Location / Description: Three and one half miles northwest of Zachary, LA. on Highway 964
Parish: East Baton Rouge

D. Coordinates: Latitude - Degrees 30; Minutes 41; Seconds 21
Longitude - Degrees 91; Minutes 11; Seconds 33

E. Mailing Address:
(Permit Holder): Remediation Services of Louisiana
1225 Neosho Ave.
Baton Rouge, LA. 70802

(Property Owner): Wilmer R. Mills
22552 Old Scenic Highway
Zachary, LA. 70791

F. Contacts: Brian R. Helms (Permit Holder)
Wilmer R. Mills (Property Owner)

Telephone: (Permit Holder) (225) 389-0804
(Property Owner) (225) 654-9372

G. Type and Purpose of Operation:
Liquid Application: __X__
Solid Application: ______
Description: Organic Solids recovered after the separation and biological degradation of Food Establishment Grease Trap Waste.

H. Environmental Permits: LA. DEQ Beneficial Use Permit GTD-033-4890/P0304

I. Conformity with regional Plans. Letter from the Louisiana Resource Recovery and Development Authority (LRRDA) was filed on October 17, 1994 stating that the facility is an acceptable part of the statewide plan.

J. Zoned: Yes_X_ No___
Zone Classification: _Agricultural Pasture_

K. Types of Waste: Only organic material remaining following the processing of Grease Trap Waste. Maximum quantities (wet weight tons per week) to be applied at the facility 150 tons/week — (dry weight tons per week) 90 tons/week.

L. Proof of Public Notice - Proof of publication of the notice regarding the permit application was submitted as a part of the Permit Application dated February 08, 1996.

M. Certification: I have personally examined and am familiar with the information submitted in the attached document, and I hereby certify under penalty of law that this information is true, accurate, and complete to the best of my knowledge. I am aware that there are significant penalties for submitting false information, including the possibility of fine and/or imprisonment.

Signature: (Permit Holder) ____________

(Property Owner) ____________

Typed Name and Title (Permit Holder): A. Steven Walleck, President
(Beneficial Use Site Owner): Wilmer R. Mills, Owner

N. Third Party Documentation required in LAC 33:VII.1103.B was submitted as a part of the Beneficial Use Permit Application.

2. SECTION 1105 APPLICATION FORM - PART 1

SOLID WASTE STANDARD PERMIT APPLICATION FOR
BENEFICIAL - USE FACILITIES - PART 1

A. Applicant (Permit Holder): Remediation Services of Louisiana
Name of Property Owner: David P. Mills II

B. Facility Name: David's Place

C. Facility Location / Description: Three and one half miles northwest of Zachary, LA. on Highway 964
Parish: East Baton Rouge

D. Coordinates: Latitude - Degrees 30; Minutes 41; Seconds 21
Longitude - Degrees 91; Minutes 11; Seconds 33

E. Mailing Address:
(Permit Holder): Remediation Services of Louisiana
1225 Neosho Ave.
Baton Rouge, LA. 70802

(Property Owner): David P. Mills II
22550 Old Scenic Highway
Zachary, LA. 70791

F. Contacts: Brian R. Helms (Permit Holder)
David P. Mills (Property Owner)

Telephone: (Permit Holder) (225) 389-0804
(Property Owner) (225) 654-8858

G. Type and Purpose of Operation:
Liquid Application: __X__
Solid Application: ______
Description: Organic Solids recovered after the separation and biological degradation of Food Establishment Grease Trap Waste.

H. Environmental Permits: LA. DEQ Beneficial Use Permit GTD-033-4890/P0304

I. Conformity with regional Plans. Letter from the Louisiana Resource Recovery and Development Authority (LRRDA) was filed on October 17, 1994 stating that the facility is an acceptable part of the statewide plan.

J. Zoned: Yes_X_ No___
Zone Classification: __Agricultural Pasture__

K. Types of Waste: Only organic material remaining following the processing of Grease Trap Waste. Maximum quantities (wet weight tons per week) to be applied at the facility 150 tons/week --- (dry weight tons per week) 90 tons/week.

L. Proof of Public Notice - Proof of publication of the notice regarding the permit application was submitted as a part of the Permit Application dated February 08, 1996.

M. Certification: I have personally examined and am familiar with the information submitted in the attached document, and I hereby certify under penalty of law that this information is true, accurate, and complete to the best of my knowledge. I am aware that there are significant penalties for submitting false information, including the possibility of fine and/or imprisonment.

Signature: (Permit Holder) ____________________

(Property Owner) David P. Mills

Typed Name and Title (Permit Holder): A. Steven Walleck, President
(Beneficial Use Site Owner): David P. Mills, Owner

N. Third Party Documentation required in LAC 33:VII.1103.B was submitted as a part of the Beneficial Use Permit Application.

2. SECTION 1105 APPLICATION FORM - PART 1

SOLID WASTE STANDARD PERMIT APPLICATION FOR
BENEFICIAL - USE FACILITIES - PART 1

A. Applicant (Permit Holder): Remediation Services of Louisiana
Name of Property Owner: C. O. McKerley

B. Facility Name: McKerley Property

C. Facility Location / Description: Two and one half miles West of Zachary, LA. on Highway 964; three quarters of a mile south of Highway 64.
Parish: East Baton Rouge

D. Coordinates: Latitude - Degrees 30; Minutes 38; Seconds 39
Longitude - Degrees 91; Minutes 11; Seconds 55

E. Mailing Address:
(Permit Holder): Remediation Services of Louisiana
1225 Neosho Ave.
Baton Rouge, LA. 70802

(Property Owner): C. O. McKerley
19451 Old Scenic Highway
Zachry, LA. 70791

F. Contacts: Brian R. Helms (Permit Holder)
C. O. McKerley (Property Owner)

Telephone: (Permit Holder) (225) 389-0804
(Property Owner) (225) 654- 7582

G. Type and Purpose of Operation:
Liquid Application: __X__
Solid Application: ______
Description: Organic Solids recovered after the separation and biological degradation of Food Establishment Grease Trap Waste.

H. Environmental Permits: LA. DEQ Beneficial Use Permit GTD-033-4890/P0304

I. Conformity with regional Plans. Letter from the Louisiana Resource Recovery and Development Authority (LRRDA) was filed on October 17, 1994 stating that the facility is an acceptable part of the statewide plan.

J. Zoned: Yes_X_ No___
Zone Classification: _Agricultural Pasture__

K. Types of Waste: Only organic material remaining following the processing of Grease Trap Waste. Maximum quantities (wet weight tons per week) to be applied at the facility 150 tons/week --- (dry weight tons per week) 90 tons/week.

L. Proof of Public Notice - Proof of publication of the notice regarding the permit application was submitted as a part of the Permit Application dated February 08, 1996.

M. Certification: I have personally examined and am familiar with the information on this document, and I hereby certify under penalty of law that this information is true, accurate, and complete to the best of my knowledge. I am aware that there are significant penalties for submitting false information, including the possibility of fine and/or imprisonment.

Signature: (Permit Holder) ______________

(Property Owner) C. O. McKerley

Typed Name and Title (Permit Holder): A. Steven Walleck, President
(Beneficial Use Site Owner): C. O. McKerley, Owner

N. Third Party Documentation required in LAC 33:VII.1103.B was submitted as a part of the Beneficial Use Permit Application.

2. SECTION 1105 APPLICATION FORM - PART 1

SOLID WASTE STANDARD PERMIT APPLICATION FOR
BENEFICIAL - USE FACILITIES - PART 1

A. Applicant (Permit Holder): Remediation Services of Louisiana
Name of Property Owner: Billy Kalencki

B. Facility Name: Billy's Place

C. Facility Location / Description: Seven miles northwest of Zachary, LA.
on Highway 964
Parish: East Feliciana

D. Coordinates: Latitude - Degrees 30; Minutes 43; Seconds 30
Longitude - Degrees 91; Minutes 13; Seconds 40

E. Mailing Address:
(Permit Holder): Remediation Services of Louisiana
1225 Neosho Ave.
Baton Rouge, LA. 70802

(Property Owner): Billy Kalencki
P.O. Box 135
Slaughter, LA. 70777

F. Contacts: Brian R. Helms (Permit Holder)
Billy Kalencki (Property Owner)

Telephone: (Permit Holder) (225) 389-0804
(Property Owner) (225) 654-5489

G. Type and Purpose of Operation:
Liquid Application: __X__
Solid Application: ______
Description: Organic Solids recovered after the separation and biological degradation of Food Establishment Grease Trap Waste.

H. Environmental Permits: LA. DEQ Beneficial Use Permit GTD-033-4890/P0304

I. Conformity with regional Plans. Letter from the Louisiana Resource Recovery and Development Authority (LRRDA) was filed on October 17, 1994 stating that the facility is an acceptable part of the statewide plan.

J. Zoned: Yes___ No_X__
Zone Classification: __NA_

K. Types of Waste: Only organic material remaining following the processing of Grease Trap Waste. Maximum quantities (wet weight tons per week) to be applied at the facility 150 tons/week --- (dry weight tons per week) 90 tons/week.

L. Proof of Public Notice - Proof of publication of the notice regarding the permit application was submitted as a part of the Permit Application dated February 08, 1996.

M. Certification: I have personally examined and am familiar with the information submitted in the attached document, and I hereby certify under penalty of law that this information is true, accurate, and complete to the best of my knowledge. I am aware that there are significant penalties for submitting false information, including the possibility of fine and/or imprisonment.

Signature: (Permit Holder) [signature]

(Property Owner) Billy Kalencki

Typed Name and Title (Permit Holder): Brian R. Helms, Engineer
(Beneficial Use Site Owner): Billy Kalencki, Owner

N. Third Party Documentation required in LAC 33:VII.1103.B was submitted as a part of the Beneficial Use Permit Application.

2. SECTION 1105 APPLICATION FORM - PART 1

SOLID WASTE STANDARD PERMIT APPLICATION FOR
BENEFICIAL - USE FACILITIES - PART 1

A. Applicant (Permit Holder): Remediation Services of Louisiana
Name of Property Owner: Henry Baxter

B. Facility Name: Baxter Farm

C. Facility Location / Description: On the East side of Highway 61, two miles north of the intersection of Highways 61 and 964
Parish: East Baton Rouge

D. Coordinates: Latitude - Degrees 30; Minutes 36; Seconds 30
Longitude - Degrees 91; Minutes 13; Seconds 34

E. Mailing Address:
(Permit Holder): Remediation Services of Louisiana
1225 Neosho Ave.
Baton Rouge, LA. 70802

(Property Owner): Henry Baxter
16840 Samuels Road
Zachary, LA. 70791

F. Contacts: Brian R. Helms (Permit Holder)
Henry Baxter (Property Owner)

Telephone: (Permit Holder) (225) 389-0804
(Property Owner) (225) 654-5100 654-7368

G. Type and Purpose of Operation:
Liquid Application: __X__
Solid Application: ______
Description: Organic Solids recovered after the separation and biological degradation of Food Establishment Grease Trap Waste.

H. Environmental Permits: LA. DEQ Beneficial Use Permit GTD-033-4890/P0304

I. Conformity with regional Plans. Letter from the Louisiana Resource Recovery and Development Authority (LRRDA) was filed on October 17, 1994 stating that the facility is an acceptable part of the statewide plan.

J. Zoned: Yes_X_ No___
Zone Classification: __Agricultural Pasture__

K. Types of Waste: Only organic material remaining following the processing of Grease Trap Waste. Maximum quantities (wet weight tons per week) to be applied at the facility 150 tons/week --- (dry weight tons per week) 90 tons/week.

L. Proof of Public Notice - Proof of publication of the notice regarding the permit application was submitted as a part of the Permit Application dated February 08, 1996.

M. Certification: I have personally examined and am familiar with the information submitted in the attached document, and I hereby certify under penalty of law that this information is true, accurate, and complete to the best of my knowledge. I am aware that there are significant penalties for submitting false information, including the possibility of fine and/or imprisonment.

Signature: (Permit Holder) ____________________

(Property Owner) Henry Baxter

Typed Name and Title (Permit Holder): A. Steven. Walleck, President
(Beneficial Use Site Owner): Henry Baxter, Owner

N. Third Party Documentation required in LAC 33:VII.1103.B was submitted as a part of the Beneficial Use Permit Application.

2. SECTION 1105 APPLICATION FORM - PART 1

SOLID WASTE STANDARD PERMIT APPLICATION FOR
BENEFICIAL - USE FACILITIES - PART 1

A. Applicant (Permit Holder): Remediation Services of Louisiana
Name of Property Owner: Elliot Cocoran

B. Facility Name: Cocoran Farm

C. Facility Location / Description: One and one tenth miles north northwest of the intersection of Highway 19 and Highway 412 on Midway Road in Slaughter LA.
Parish: East Feliciana

D. Coordinates: Latitude - Degrees 30; Minutes 43; Seconds 34
Longitude - Degrees 91; Minutes 09; Seconds 07

E. Mailing Address:
(Permit Holder): Remediation Services of Louisiana
1225 Neosho Ave.
Baton Rouge, LA. 70802

(Property Owner): Elliot Cocoran
P.O. Box 173
Slaughter, LA. 70777

F. Contacts: Brian R. Helms (Permit Holder)
Elliot Cocoran (Property Owner)

Telephone: (Permit Holder) (225) 389-0804
(Property Owner) (225) 654-4609

G. Type and Purpose of Operation:
Liquid Application: __X__
Solid Application: ______
Description: Organic Solids recovered after the separation and biological degradation of Food Establishment Grease Trap Waste.

H. Environmental Permits: LA. DEQ Beneficial Use Permit GTD-033-4890/P0304

I. Conformity with regional Plans. Letter from the Louisiana Resource Recovery and Development Authority (LRRDA) was filed on October 17, 1994 stating that the facility is an acceptable part of the statewide plan.

J. Zoned: Yes___ No_X__
Zone Classification: __NA_

K. Types of Waste: Only organic material remaining following the processing of Grease Trap Waste. Maximum quantities (wet weight tons per week) to be applied at the facility 150 tons/week — (dry weight tons per week) 90 tons/week.

L. Proof of Public Notice - Proof of publication of the notice regarding the permit application was submitted as a part of the Permit Application dated February 08, 1996.

M. Certification: I have personally examined and am familiar with the information submitted in the attached document, and I hereby certify under penalty of law that this information is true, accurate, and complete to the best of my knowledge. I am aware that there are significant penalties for submitting false information, including the possibility of fine and/or imprisonment.

Signature: (Permit Holder) ____________________

(Property Owner) ____________________

Typed Name and Title (Permit Holder): Brian R. Helms, Engineer
(Beneficial Use Site Owner): Elliot Cocoran, Owner

N. Third Party Documentation required in LAC 33:VII.1103.B was submitted as a part of the Beneficial Use Permit Application.

9. DESCRIPTION OF APPLICATION METHOD

All product arrives at the Beneficial Use site in RSL owned 6000 gallon tanker trucks which originate solely at the RSL Baton Rouge Type II-A grease trap waste processing facility. Product is transferred directly from the tanker truck through a 4" hose to a 3200 gallon honeywagon. The honeywagon's vacuum pump provides the suction to move the product. In ten years of operation product spillage has not been a problem. The honeywagon is pulled by a large four wheel drive farm tractor to the application area to be used that day. The injection quills are lowered into the ground to a depth of between 8 and 12 inches and the tank is pressurized. As the tractor pulls the honeywagon along the predetermined route, the discharge valve is opened to allow product to be subsurface injected. Other farm type apparatus including a 21' wide disk, 20'rotary hoe and a harrow are available for use as necessary to return the field to undisturbed appearance.

The maximum planned application rates for the Beneficial Use site is in accordance with LSU's study, i.e., two acre inches per annum. Two achieve a consistent application rate, the site plot plan is divided into fields with premeasured acreage. The allowable application quantity in gallons (it is assumed that the dry weight / liquid gallons is a constant) will be determined for each field. Tanker loads leaving Baton Rouge are predestined for a specific field for eventual unloading. Loads can be distributed uniformly throughout the fields by employing subsurface injection. The site Application Superintendent knows that for a 2 acre inch application, the honeywagon must travel 1600 feet to empty its load. Consistent product, equipment and personnel experience allow the application to e very uniform throughout each field.

a. Quality Control Testing

The Beneficial Use Facility will be operated as an extension of the RSL's Type II-A facility in Baton Rouge. All product applied at the proposed Beneficial Use Facility will originate as the recaptured organic material separated during grease trap waste recycling operations. It must be remembered that all products used in this application are recovered and filtered food products prepared for human consumption. The product profile of this stream has been thoroughly examined in preparation for our Beneficial Use Permit Application (submitted February 08, 1996) and approved by the LA DEQ. The consistent volume of grease trap waste handled at the Baton Rouge Facility (500,000 gal/mo.) allows the organic material to be homogeneous and consistent.

- The receipt of hazardous waste shall be strictly prohibited and prevented.
- Only waste with a demonstrated beneficial use will be applied.
- The grease trap waste accepted at the Baton Rouge Type II-A facility is subjected to be tested and manifesting required for its Type II-A Permit. RSL certifies that the material to be beneficially applied will contain no more than 2% free oil and grease by volume and no more than 4% total oil and grease by volume.
- RSL will perform weekly sample testing for free oil and grease by volume utilizing our in house lab.
- RSL will have an outside lab perform a complete sample analysis (as per the attached Analytical Data Package) on an anual basis.

b. STORAGE PROCEDURES

The Beneficial Use Material is one of the end products produced at the Remediation Services of Louisiana Type II-A Grease Trap Waste Processing Facility. At the facility, as the Beneficial Use Material is produced it is put into two 21,000 gallon vertical cone bottom tanks for storage and final product clarrification. When ready for field application it is loaded into 6000 gallon over the road tanker trailers for transport to the application site. At the application site the product is transfered to the 3200 gallon honey wagon for application. No product is stored on the ground at any time at either the Processing facility or the application site. There are four tanker trailers in the Beneficial Use Material pool. Normal operation procedures have two of the trailers at the RSL Processing Facility staged for loading and two of the trailers staged at the application site for unloading at any given time. Typical transportation procedures call for the truck driver to take a loaded trailer to the application site and return with an empty trailer.

i. RUN-ON / RUN-OFF CONTROL

All sites selected for Beneficial Use Application will meet the requirements stipulated in LAC 33:VII.1109 sections B and C. All product will be subsurface injected. A 100 foot buffer zone will be maintained at all selected sites. No product wll be applied on slopes greater than six percent. No product will be applied within 300 feet of any water wells. No product will be applied within the 10 year high water mark for streams. No product will be stored at any time upon the ground. Product application will be discontinued during times of excessive moisture, this is done primarily for cosmetic reasons to avoid having the application equipment cause ruts in the pasture land.

ii. MAXIMUM INVENTORY

All Beneficial Use Material will at all times be stored in sealed enclosed vessels. No product will be stored on the ground at an time. At the application stite, it will remain in 6000 gallon over the road tanker trailers until ready for application via the 3200 gallon honey wagon. There are four such trailers available for transporting Beneficial Use Material with normally two of them located at the application site. At the RSL Type II-A Processing Facility the tankage allocated for Beneficial Use Material consists of two 22,000 gallon cone bottom tanks. Thus the maximum inventory that would be possible would be 71,000 gallons.

iii. SOIL/GROUNDWATER CONTAMINATION PREVENTATIVE MEASURES

The possibility of nitrogen leaching into the groundwater aquifer is determined by the physical soil, the clay content, high water table and the primary microbial dentitrification. At the selected sites, the groundwater high water table appears to be thirty to thirty-six inches below the surface. This information for the specific soil types encountered in this applications properties comes from Table 15 of the Louisiana Soil Survey for the properties located in the Feliciana Parishes. The Soil Survey for East Baton Rouge Parish; is much older and does not include this data. Because of our operational practices we do not consider the potential for nitrogen to enter groundwater to be a significant concern for two reasons; First our application rates were calculated by the LSU Agronomy studies to optimize crop growth rates and are many orders of magnitude below maximum allowable soil limiting rates. Second, we are applying our beneficial use material on privately owned pasture land whose owners only concern is improving the pasture lands performance and would not tolerate his fields being defaced by equipment operating in soggy conditions. For this reason operations are suspended whenever soil conditions are not appropriate. Additionally, since nearly all of the dentrification system that generates free usable plant nitrogen occurs near the root system of the grass (within the top 3" to 6" of the soil), there appears very little chance of appreciable amounts of nitrogen ever leaching past the subsurface clay barrier that exists in nearly all soils contemplated to the high water mark.

iv. DISPERSION CONTROL DUE TO WIND

No products will be stored on site. Organic material to be beneficially applied will be transported to the site in closed tanker trailers, then pumped to a closed tank "honeywagon" for land application. The honeywagon will then inject the slurry eight to twelve inches under the surface. Our own testing and LSU's applications suggestions indicated that once the liquid soaks into the soil, no detectable odor remains. For good measure we have added the ChemStation Fogit Odor Control System In over nine years of operation there have never been any odor complaints, even from onsite residences and Hollywood movie productions. Attraction of vectors has not been a problem to date.

All product comes to the site from RSL's Type II-A facility in Baton Rouge, which utilizes separation processes to remove trash and debris from the process streams. For this reason, litter control at the Beneficial Use site will not be a problem. The product handled and injected is in a liquid slurry state, this in of itself negates any real concern for dust problems.

C. RECORD KEEPING AND REPORTS

The Beneficial Use facility will only accept product transported to the site in Remediation Services of Louisiana tractor-trailers and originating at the Remediation Services of Louisiana Type II-A facility in Baton Rouge. Record keeping responsibilities for this operation will rest with the Plant Manager of the Baton Rouge facility and with the Beneficial Use sites' Application Superintendent. All product loads transported to the Beneficial Use site will be homogeneous and relatively uniform in content. Product will be transloaded directly from the over the road truck trailer to the application honeywagon at the time of product application injection. There will be no storage facilities at the Beneficial Use site.

The Baton Rouge facility and the Beneficial Use Site Superintendent will maintain records to document product application. The log book maintained by the Beneficial Use Site Superintendent will be kept in a secure environment and the records will be accessible. The log books will indicate: date, transporting tanker number, quantity of applied material, field location of application and any comments applicable such as weather conditions. The Baton Rouge facility will maintain records of the transporting drivers logs and will be primarily used for payroll purposes. Prior to departing Baton Rouge for the Beneficial Use site, the driver will confirm his understanding of location of transloading point ; which unit of the Beneficial Use Facility and the staging location for transloading.

RSL will submit annual reports to the LA DEQ Solid Waste Division (or current applicable division of DEQ) indicating the quantities of waste beneficially applied expressed in wet-weight tons and dry weight tons per year. Calculation methodology will also be submitted. The specified form will be utilized. The reporting period for the annual report will be from July 01 through June 30 and will terminate upon closure of the facility. Reports will be submitted by August 01 of each reporting year. If more than one permitted facility are operated, separate annual report forms will be utilized. Since no industrial solid waste will be permitted entry to the facility, the seven digit industrial waste number does not apply to this facility. RSL's corporate office will maintain all records necessary for the effective management of the facility and for preparing the required reports. These records will be maintained and kept on file for at least three years after facility closure.

Because of the benign chemical characteristics of the waste stream involved with this application, RSL does hereby request an exemption from the testing and reporting requirements of Section 1109.F.b.ii f and g which require semi-annual soil/waste mixture testing. This exemption was granted on our initial Beneficial Use Permit Application dated February 06, 1996. Our Beneficial Use application rate guidelines (gallons of product per acre) are based upon optimum plant nutrient uptake rates and thus yield a very small fraction of allowable metals or nitrogen application loadings.

10. STORAGE ACKNOWLEDGMENT

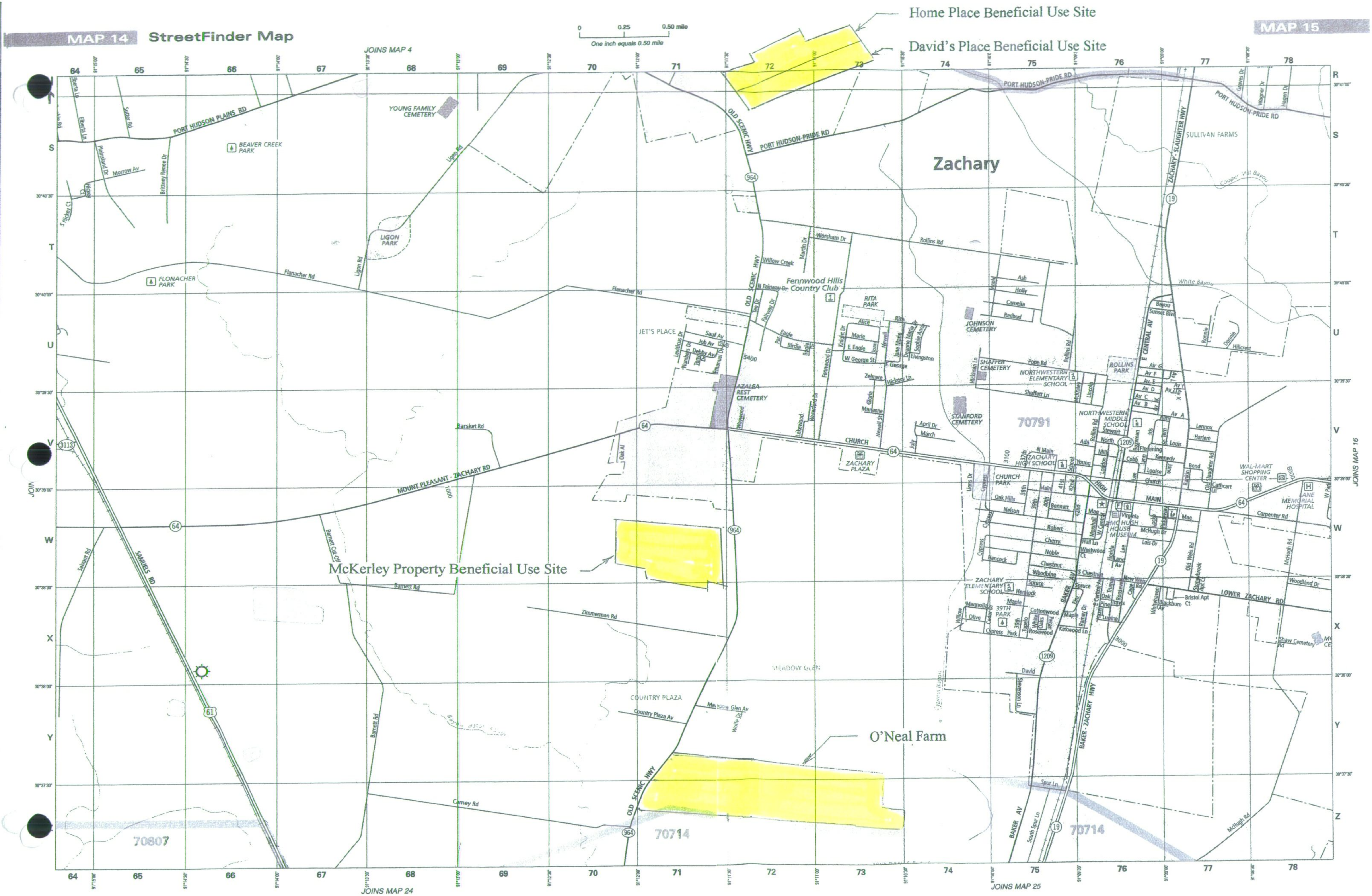
We hereby acknowledge that at least 75 percent of the material placed in storage during a year will be sent to market or other secure storage within the following year. In actuality, no material will be stored for more than a week or two due to the operating constraints of the RSL Processing Facility. The only reason material will be stored for more than a few days would be due to prolonged periods of inclement weather. In such case, material would remain stored inside sealed closed steel tanks or aluminum tanker trailers.

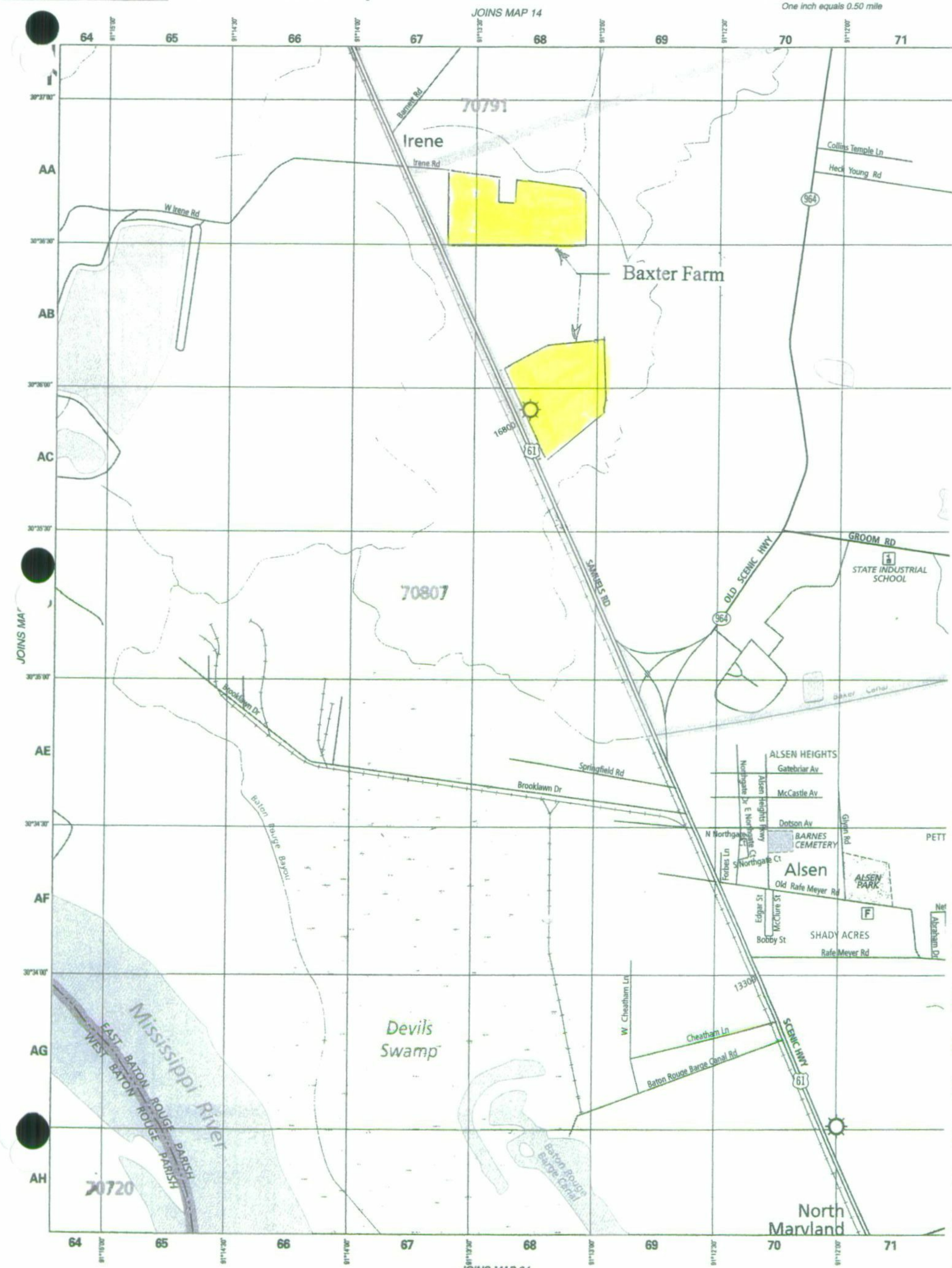
11. DEMONSTRATION OF PROTECTION OF PUBLIC HEALTH

Our Beneficial Use Material and application techniques were the subject of extensive studies by the Louisiana State University Agronomy Department and have been sucessfully implemented for over ten years. The Louisiana Department of Environmental Quality approved our initial Beneficial Use Permit in June 1996 and the process was inspected without deficiencies on an annual basis. The hollywood movie; The Dukes of Hazzard was partially filmed on the Mills property while our Beneficial Use material was being applied. The equipment even makes a cameo appearance in one scene. The following documentation from the LSU studies provide evidence of the processes effectiveness at both increasing agricultural yields and protecting the environment.

12. END USERS OF THE MATERIAL

We have found that the best use of our Beneficial Use Material is in enhancing pasture grass production. While the material would undoubtedly work well in row crop applications, the costs involved in storing the material for long periods prohibits it's widespread use in any endeavor that would not allow near continuous applications. Pasture land typically has low natural fertility and responds dramatically to the application of our material. High transportation costs also limit its economic viability to locations within about sixty miles of the RSL Baton Rouge processing facility. In the eleven years of operation, we have applied the material to cattle ranching pasture lands in East and West Feliciana, St. Helena and East Baton Rouge Parishes. All sites must have direct access to roads suitable for 80,000 pound truck operation. To meet buffer zone requirements and prevent possible annoyances to neighboring lands, no site will be considered that is less than thirty acres. The attached Section 1105 Permit Applications, USGS Topography Maps and street maps identify the currently requested sites. They are identified as Wilmer Mills and David Mills Properties, McKerly Property, Baxter Farm, O'Neal Farm, and Cocoran Farm. As was the case with our current Beneficial Use permit, Remediation Services of Louisiana requests authorization to add additional sites within the State of Louisiana from time to time throughout the authorization period of the Beneficial Use Permit that meet the requirements for beneficial use application. We understand that notification and approval from the Louisiana Department of Environmental Quality and land owner approval will be required for any site change. We also understand that any future site change will be considered a permit minor modification and will not require an extensive review period.


MAP 14
StreetFinder Map
MAP 15
One inch equals 0.50 mile
JOINS MAP 4
JOINS MAP 24
JOINS MAP 25
JOINS MAP 16
Home Place Beneficial Use Site
David's Place Beneficial Use Site
McKerley Property Beneficial Use Site
O'Neal Farm
Zachary
PORT HUDSON PLAINS RD
PORT HUDSON-PRIDE RD
OLD SCENIC HWY
MOUNT PLEASANT - ZACHARY RD
SAMUELS RD
ZACHARY - SLAUGHTER HWY
BAKER - ZACHARY HWY
LOWER ZACHARY RD
BAKER AV
E CENTRAL AV
MAIN
YOUNG FAMILY CEMETERY
BEAVER CREEK PARK
LIGON PARK
FLONACHER PARK
JET'S PLACE
Fennwood Hills Country Club
RITA PARK
JOHNSON CEMETERY
SHAFFER CEMETERY
NORTHWESTERN ELEMENTARY SCHOOL
ROLLINS PARK
AZALEA REST CEMETERY
STANFORD CEMETERY
NORTHWESTERN MIDDLE SCHOOL
ZACHARY HIGH SCHOOL
CHURCH PARK
ZACHARY PLAZA
ZACHARY ELEMENTARY SCHOOL
39TH PARK
MCHUGH HOUSE MUSEUM
WAL-MART SHOPPING CENTER
LANE MEMORIAL HOSPITAL
SULLIVAN FARMS
COUNTRY PLAZA
MEADOW GLEN
70807
70714
70791


0 0.25 0.50 mile
One inch equals 0.50 mile
JOINS MAP 14
JOINS MAP 34
Irene
70791
Irene Rd
W Irene Rd
Barnett Rd
Collins Temple Ln
Heck Young Rd
964
Baxter Farm
16800
61
SAMUELS RD
OLD SCENIC HWY
GROOM RD
STATE INDUSTRIAL SCHOOL
70807
Brooklawn Dr
Springfield Rd
ALSEN HEIGHTS
Gatebriar Av
McCastle Av
Dotson Av
BARNES CEMETERY
Alsen
ALSEN PARK
Old Rafe Meyer Rd
SHADY ACRES
Rafe Meyer Rd
Bobby St
Edgar St
McClure St
Forbes Ln
Glynn Rd
Abraham Dr
PETT
Baton Rouge Bayou
Devils Swamp
Mississippi River
EAST BATON ROUGE PARISH
WEST BATON ROUGE PARISH
70720
W Cheatham Ln
Cheatham Ln
Baton Rouge Barge Canal Rd
Baton Rouge Barge Canal
SCENIC HWY
13300
North Maryland
AA
AB
AC
AE
AF
AG
AH
64
65
66
67
68
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70
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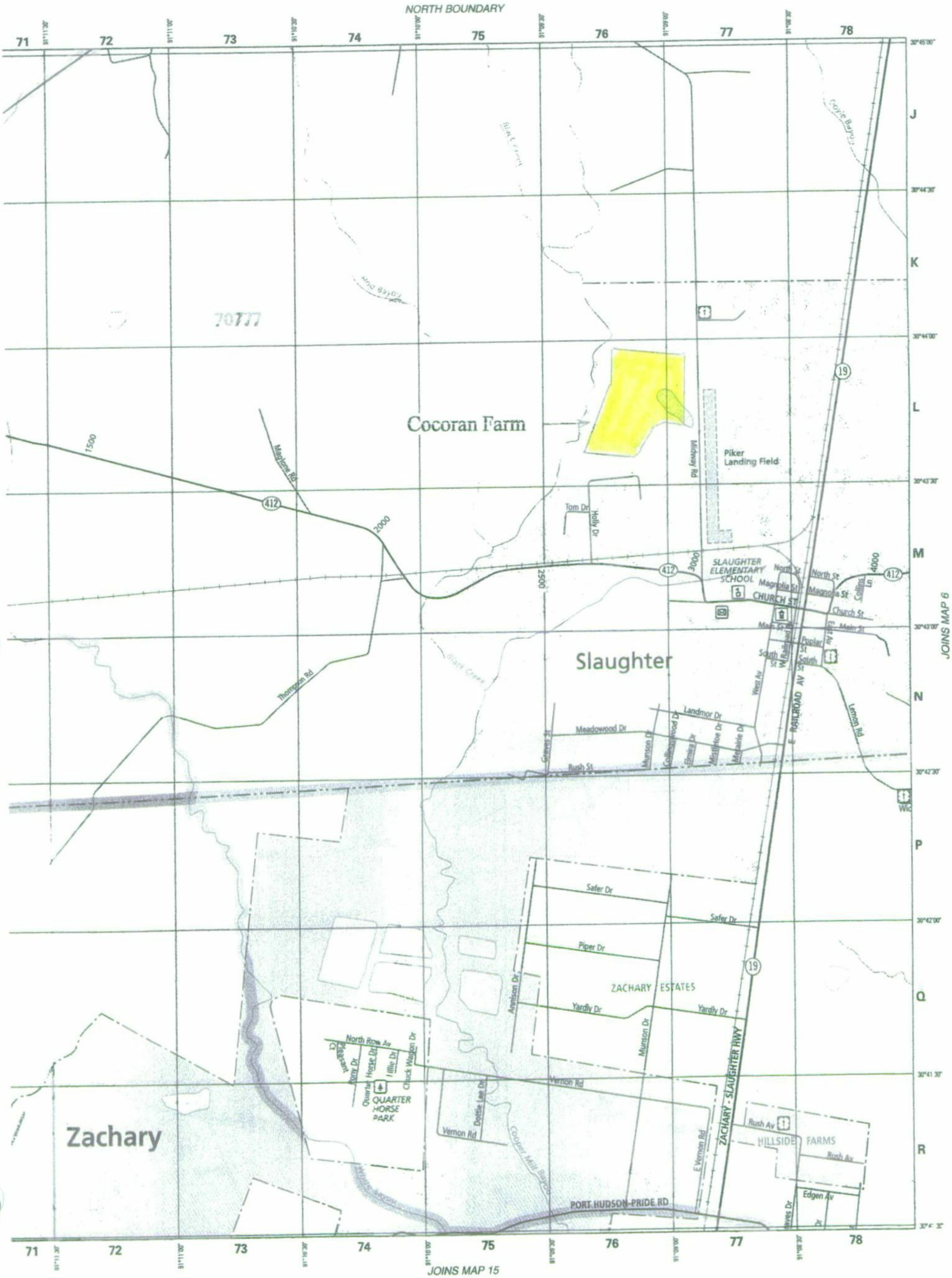
NORTH BOUNDARY
JOINS MAP 6
JOINS MAP 15
Cocoran Farm
Piker Landing Field
Slaughter
SLAUGHTER ELEMENTARY SCHOOL
CHURCH ST
North St
Magnolia St
Church St
Main St
Poplar
South St
W Railroad Av
E RAILROAD AV
West Av
Lemon Rd
Landmor Dr
Meadowood Dr
Munson Dr
Collinswood Dr
Elmira Dr
Mistletoe Dr
Metairie Dr
Graves St
Rush St
Midway Rd
Tom Dr
Holly Dr
Magnolia Rd
Thompson Rd
Black Creek
ZACHARY ESTATES
Safer Dr
Piper Dr
Yardly Dr
Annison Dr
ZACHARY - SLAUGHTER HWY
North Row Av
Pleasant Ct
Pony Dr
Horse Dr
Quarter Horse Dr
Lillie Dr
Chuck Wagon Dr
QUARTER HORSE PARK
Vernon Rd
Dottie Lee Dr
E Vernon Rd
Cooper Mill Bayou
Rush Av
HILLSIDE FARMS
Edgen Av
PORT HUDSON-PRIDE RD
Zachary
70777
412
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1500
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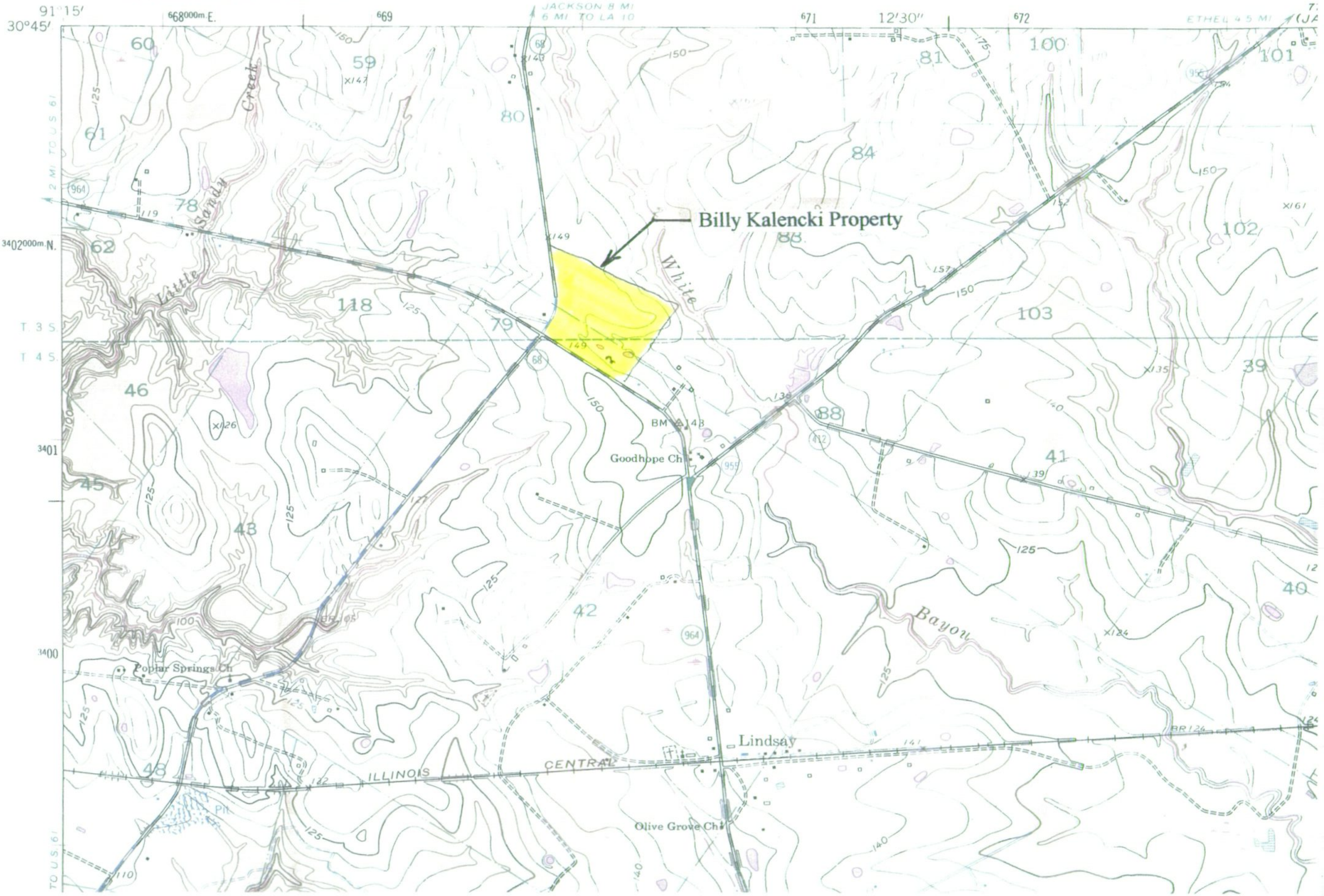
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

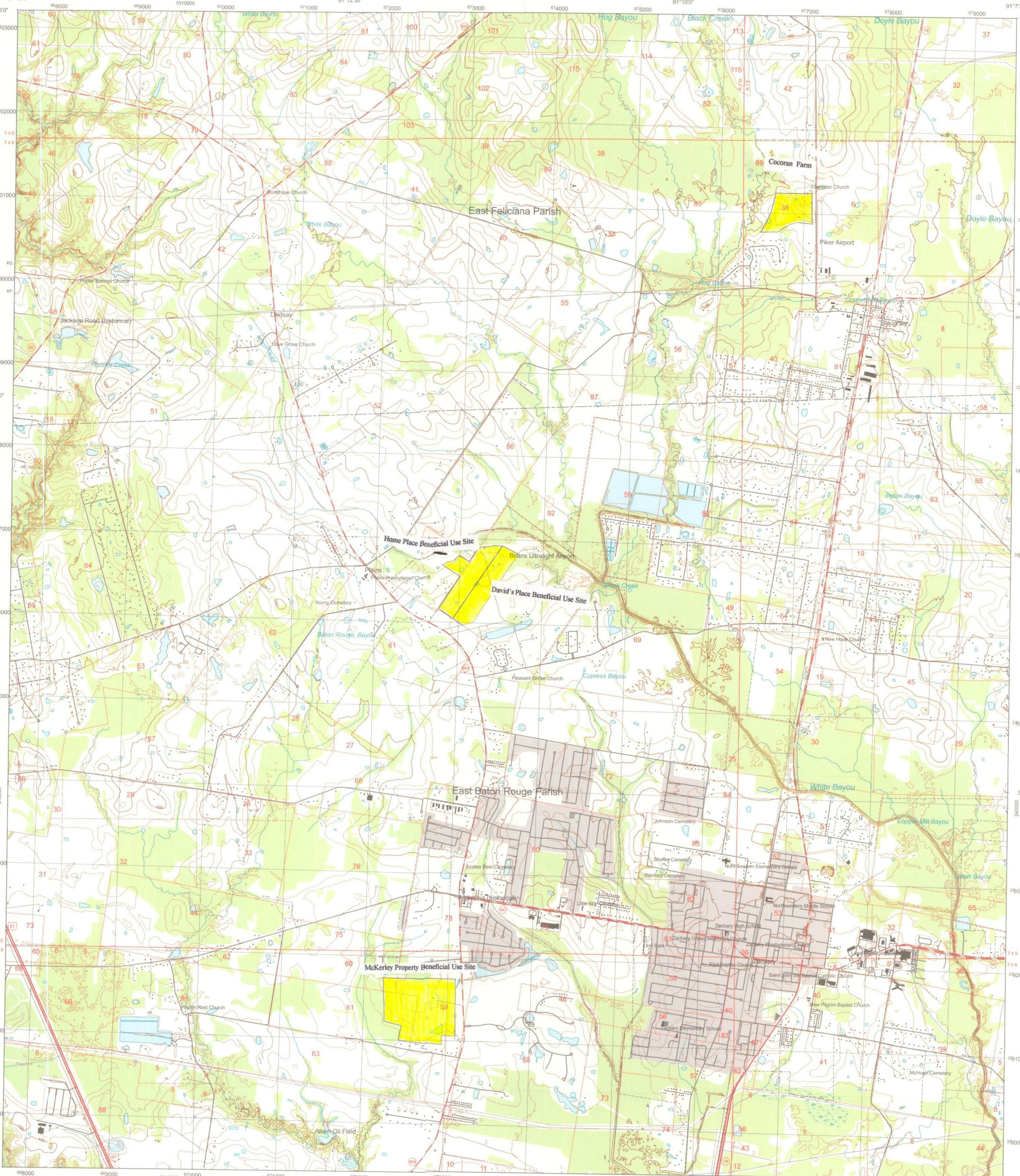
ZACHAR[illegible] Quadrangle Sheet 150A



U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

STATE OF LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

ZACHARY QUADRANGLE
LOUISIANA
7.5-MINUTE SERIES (TOPOGRAPHIC)



Produced by the United States Geological Survey
In cooperation with the Louisiana Department of Transportation
Topography derived using LIDAR provided by the State of Louisiana
Planimetry updated from 2004 imagery and other sources
Public Land Survey System and Survey Control .. 1954
Boundaries 2004
Woodland 2004
Names provided by GNIS 1999
UTM Grid Declination .... 0°56' East
Magnetic North Declination .... 1°0' East

North American Datum of 1983 (NAD 83). Projection and
1 000-meter grid: Universal Transverse Mercator, zone 15N
10 000-foot grid ticks: Louisiana Coordinate System (south zone)
The values of the shift between NAD 83 and
NAD 27 for 7.5-minute intersections are obtainable from
National Geodetic Survey NADCON software

U.S. National Grid
100,000-m Square ID
XQ
XP
Grid Zone Designator 15R

SCALE 1:24 000

CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
TO CONVERT FROM FEET TO METERS, MULTIPLY BY 0.3048

FOR SALE BY U.S. GEOLOGICAL SURVEY, P.O. BOX 25286, DENVER, COLORADO 80225
AND LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT, BATON ROUGE, LOUISIANA 70804
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

INTERIOR - GEOLOGICAL SURVEY, RESTON, VIRGINIA - 2006

ROAD CLASSIFICATION
Primary highway hard surface
Light-duty road, hard or improved surface
Secondary highway hard surface
Unimproved road
Interstate Route
U.S. Route
State Route

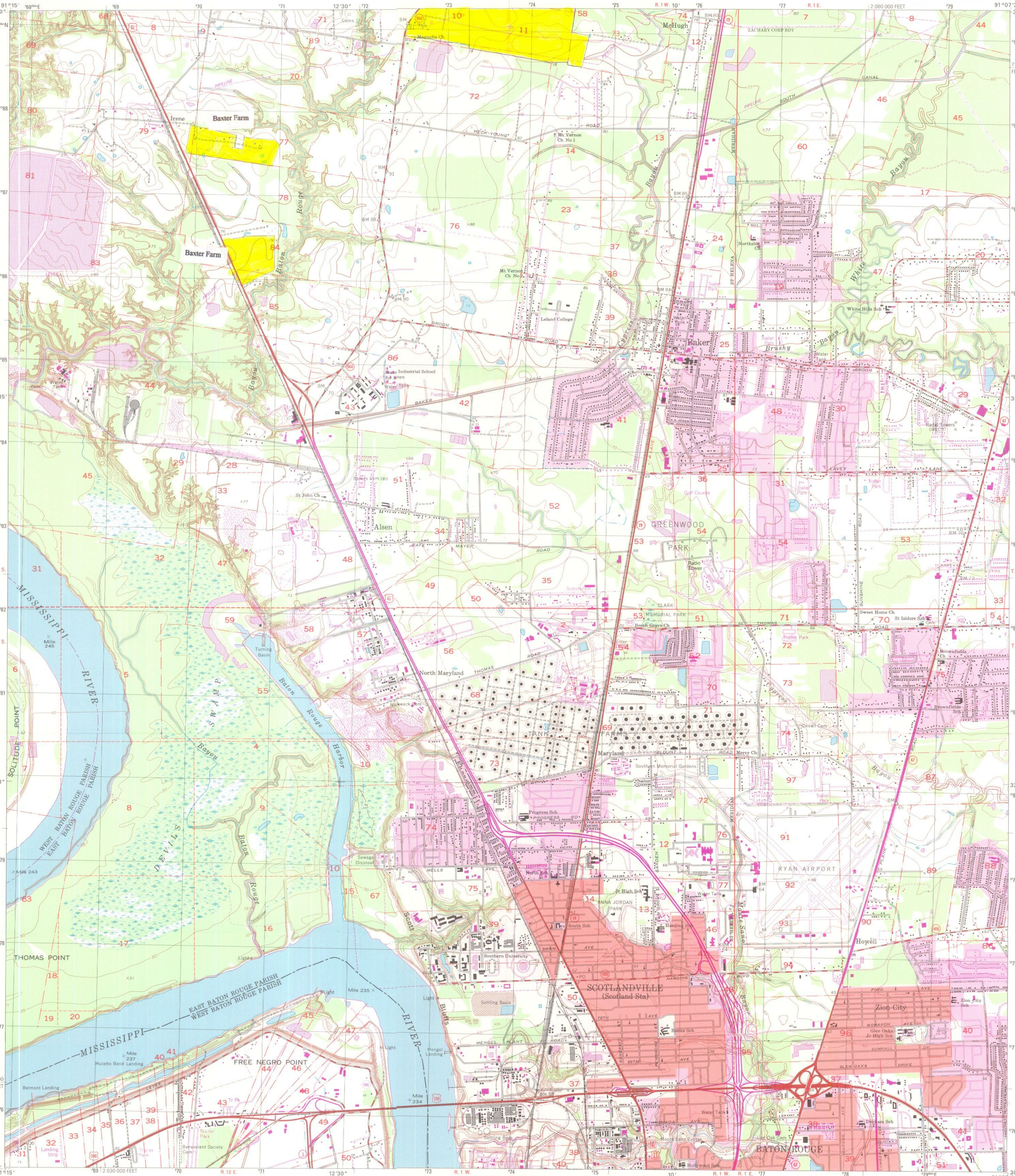
Elm Park	Jackson	Clinton
Port Hudson	Zachary	Fred
Walls	Scotlandville	Comite

ZACHARY, LA
2005
NGA 7745 II NW-SERIES V 885

USGS
science for a changing world

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

SCOTLANDVILLE QUADRANGLE
LOUISIANA
7.5-MINUTE SERIES (TOPOGRAPHIC)



Produced by the United States Geological Survey

Topography compiled 1953. Planimetry derived from imagery taken 1989 and other sources. Photoinspected using imagery dated 1995; no major culture or drainage changes observed. PLSS and survey control current as of 1963. Boundaries, other than corporate, verified 1998

North American Datum of 1927 (NAD 27). Projection and 10 000-foot ticks: Louisiana coordinate system, south zone (Lambert conformal conic)
1000-meter Universal Transverse Mercator grid, zone 15

North American Datum of 1983 (NAD 83) is shown by dashed corner ticks. The values of the shift between NAD 27 and NAD 83 for 7.5-minute intersections are obtainable from National Geodetic Survey NADCON software

Information shown in purple may not meet USGS content standards and may conflict with previously mapped contours

MN
GN
0° 55′
16 MILS
2°
36 MILS

UTM GRID AND 1998 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

KILOMETERS
METERS
MILES
FEET

CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
TO CONVERT FROM FEET TO METERS, MULTIPLY BY 0.3048

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
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A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

LOUISIANA

QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1 Port Hudson
2 Zachary
3 Fred
4 Walls
5 Comite
6 Lobdell
7 Baton Rouge West
8 Baton Rouge East

ADJOINING 7.5′ QUADRANGLE NAMES

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1998

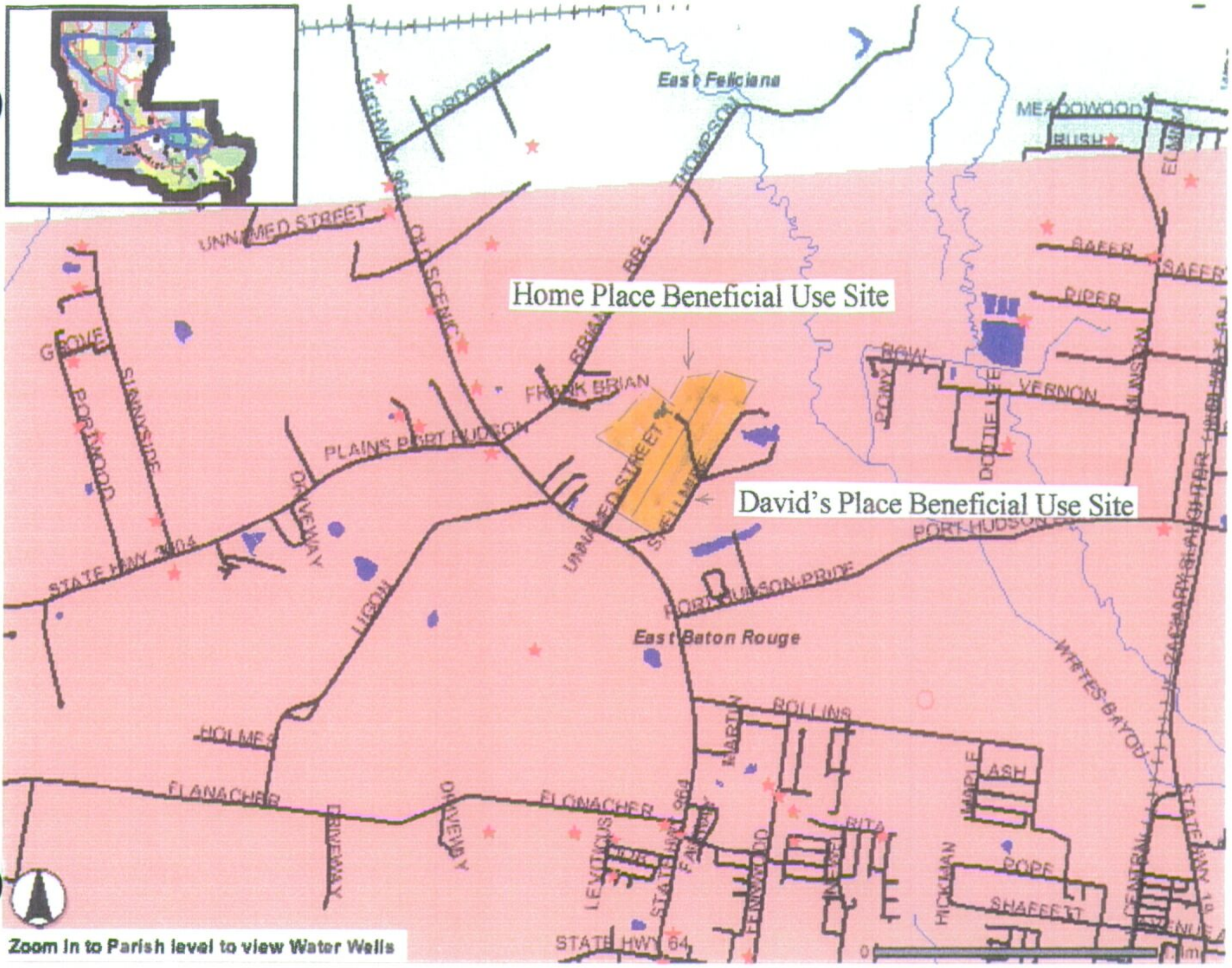
ROAD CLASSIFICATION

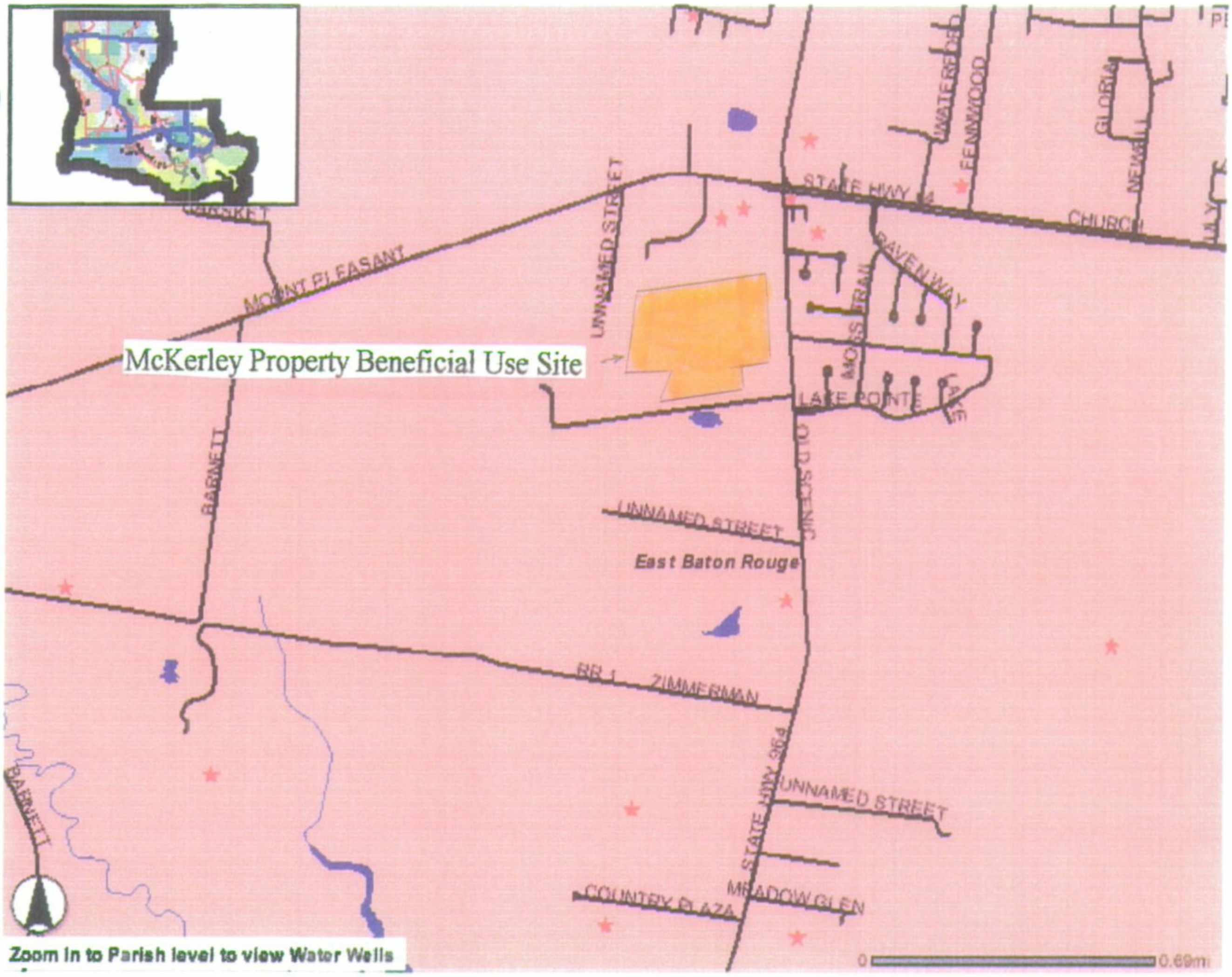
Primary highway hard surface ....
Secondary highway hard surface ....
Light-duty road, hard or improved surface ......
Unimproved road ......

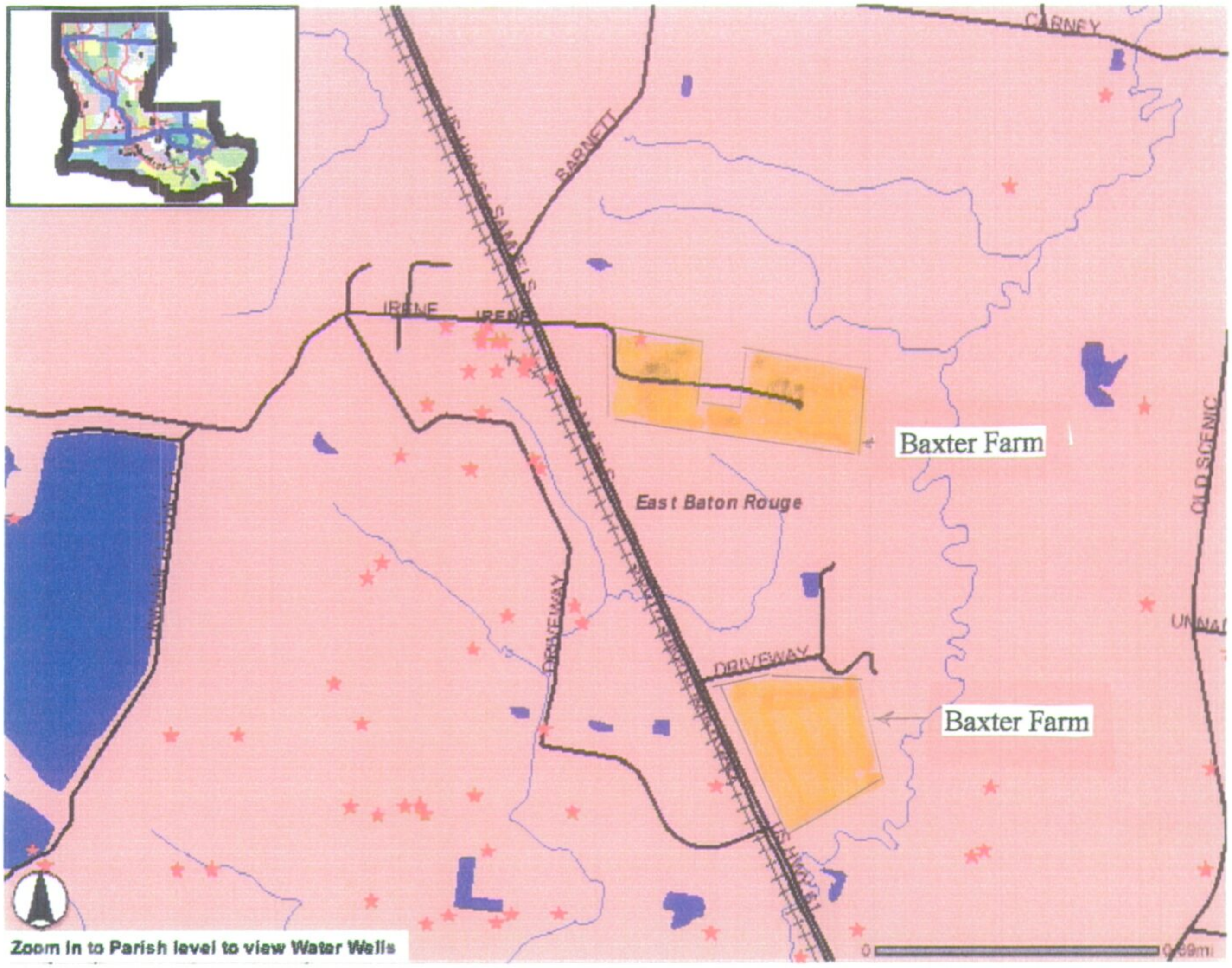
Interstate Route
U.S. Route
State Route

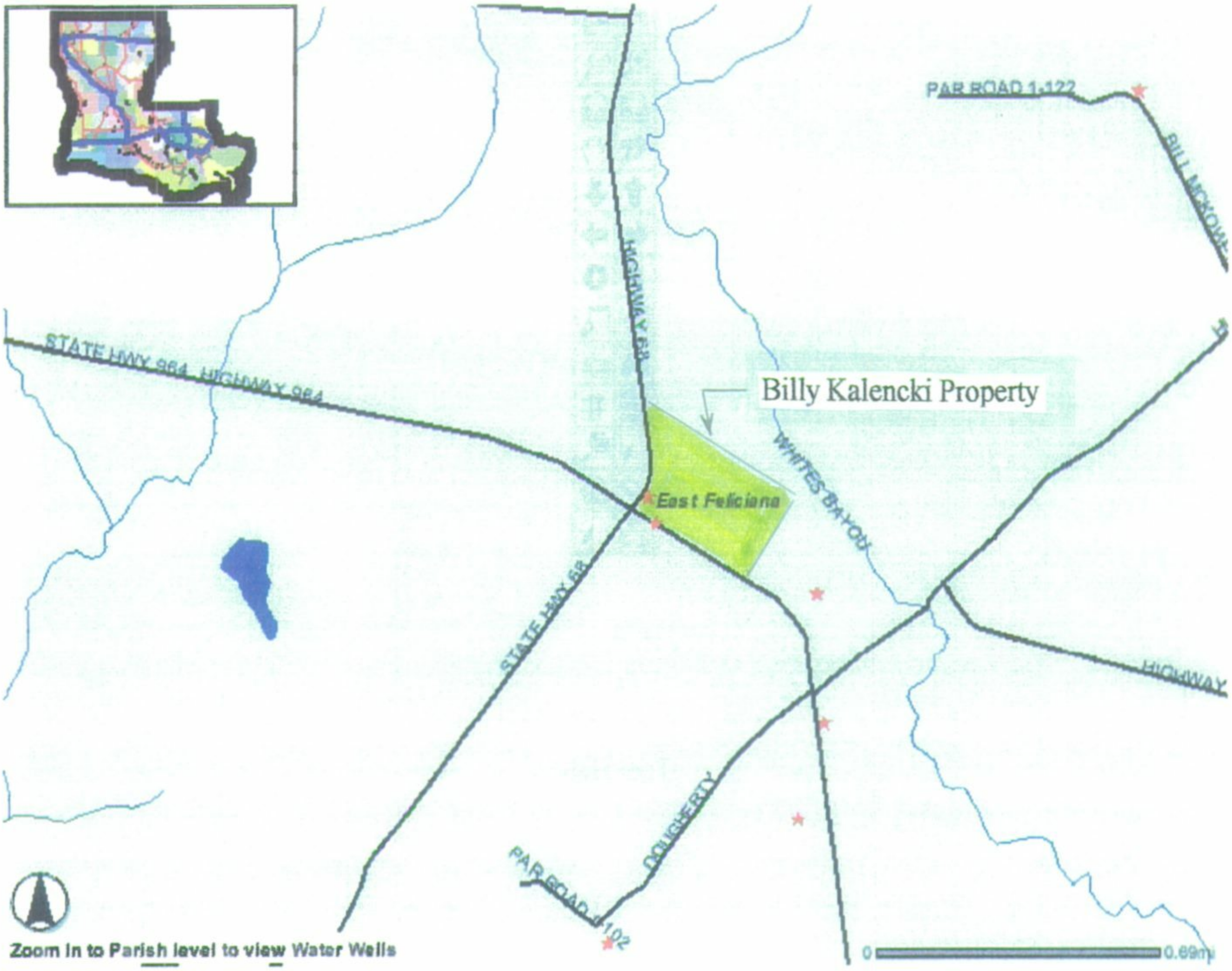
SCOTLANDVILLE, LA
1995
150 C
NIMA 7745 II SW-SERIES V885

ISBN 0-607-90391-0

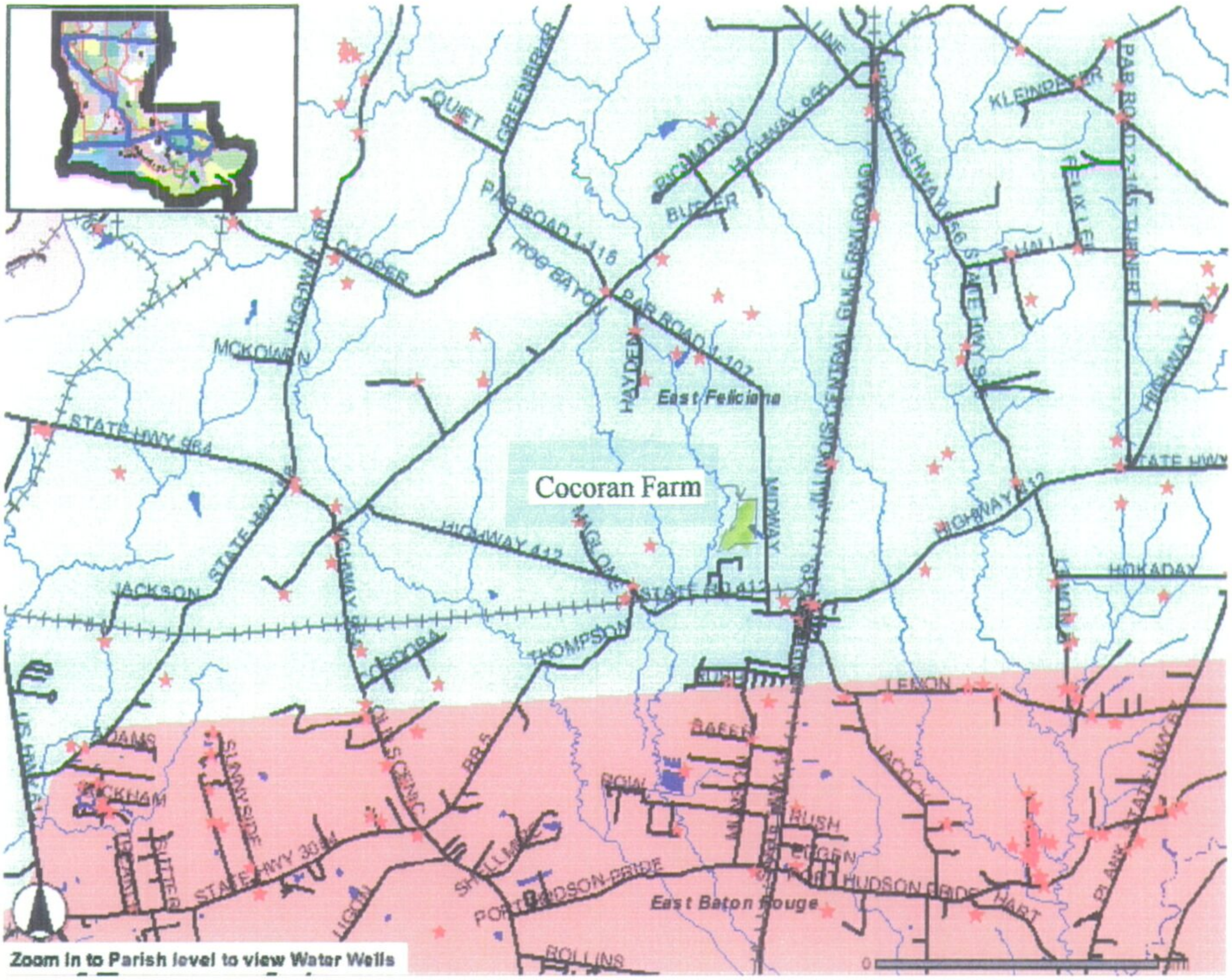

East Feliciana
Home Place Beneficial Use Site
David's Place Beneficial Use Site
East Baton Rouge
UNNAMED STREET
HIGHWAY 964
OLD SCENIC
THOMPSON
MEADOWOOD
BUSH
SAFFER
PIPER
VERNON
FRANK BRIAN
PLAINS PORT HUDSON
GROVE
SUNNYSIDE
PORTWOOD
DRIVEWAY
LIGON
PORT HUDSON-PRIDE
ROLLINS
HOLMES
FLANACHER
FLONACHER
MARTIN
ASH
MAPLE
RITA
POPE
HICKMAN
LEVITICUS
STATE HWY 64
WHITES BAYOU
Zoom In to Parish level to view Water Wells


McKerley Property Beneficial Use Site
STATE HWY 64
CHURCH
MOUNT PLEASANT
UNNAMED STREET
WATERFORD
FENNWOOD
GLORIA
NEWELL
RAVEN WAY
LAKE POINTE
BARNETT
OLD SCENIC
UNNAMED STREET
East Baton Rouge
ZIMMERMAN
STATE HWY 964
UNNAMED STREET
COUNTRY PLAZA
MEADOW GLEN
BARNETT
Zoom In to Parish level to view Water Wells
0
0.69mi


CARNEY
BARNETT
IRENE
IRENE
Baxter Farm
East Baton Rouge
OLD SCENIC
DRIVEWAY
DRIVEWAY
Baxter Farm
Zoom In to Parish level to view Water Wells


PAR ROAD 1-122
BILL MCKOWE
HIGHWAY 68
STATE HWY 964, HIGHWAY 964
Billy Kalencki Property
WHITES BAYOU
East Feliciana
STATE HWY 68
HIGHWAY
DOUGHERTY
PAR ROAD 1-102
Zoom In to Parish level to view Water Wells
0
0.69mi


Cocoran Farm
POND
East Feliciana
PAR ROAD 1-107
MIDWAY
PARISH ROAD 1-107
BLACK CREEK
HOG BAYOU
TOM
HOLLY
STATE RD 412 HIGHWAY 412
Zoom in to Parish level to view Water Wells
0


Cocoran Farm
East Feliciana
East Baton Rouge
STATE HWY 964
HIGHWAY 412
MCKOWEN
COOPER
QUIET
GREENBRIAR
RICHMOND
BUTLER
HIGHWAY 955
KLEINPETER
HAYDEN
MIDWAY
JACKSON
THOMPSON
LEMON
BAKER
ROW
RUSH
SUNNYSIDE
STATE HWY 3034
PORT HUDSON PRIDE
HUDSON PRIDE
HART
JACOCKS
ROLLINS
PLANK
HOKADAY
HIGHWAY 412
STATE HWY
Zoom in to Parish level to view Water Wells

SECTION 523.PART III ADDITIONAL SUPPLEMENTARY INFORMATION

A. AVOIDANCE OF ADVERSE ENVIRONMENTAL EFFECTS

The material described in this permit application is being applied for "beneficial use" purposes. It has been scientifically determined that the use of these organic byproducts to enhance the fertility of pasture land constitutes a legitimate beneficial use of this solid waste and is not likely to cause health or nuisance concerns. The laboratory and field trial plot tests were developed to optimize the agricultural benefits and to determine if any adverse environmental effects would result. Application techniques were developed at great expense and utilize subsurface injection and surface compaction equipment to eliminate odors and maximize agricultural benefits. Nine years of real production experience have significantly honed our techniques.

Properly applied there are absolutely no potential or real adverse environmental effects from the application of our organic material to cropland. Two scenarios that could produce unwanted environmental effects while statistically possible, have not occurred in nearly ten years of our operation; noticeable odor emissions and catastrophic spills.

The product beneficially applied is filtered food particles in slurry form which has the potential to produce odors like any decomposing organic matter would. The apparatus we utilize involves subsurface injecting the slurry so that the soil contains any odor as the food naturally decomposes and provides nutrients to the soil. To alleviate the possibility that objectionable odors could emanate from the application process, we have outfitted the honeywagon injection bar with ChemStation Fogit Odor Control Systems that deploy Product 8106 Scented Odor Neutralizer as an aerosol mist. This product has been proven in many industrial and landfill applications and has been responsible for the total elimination of odor complaints at the RSL Baton Rouge Type II-A Process Plant. In ten years of Beneficial Use product application there has never been any odor complaints. Additionally, for the last four months the current site has been used as the prime "shooting location" for the Hollywood movie "The Dukes of Hazard". While we keep our application apparatus and trucks on adjacent fields to remain off camera, the movie stars are performing on fields that have fairly fresh organic material treatments and are in close proximity to our operations and have never made any comments about any odors. .

The other possible environmental impact would be a catastrophic loss of product from the over the road tanker trailers (approx. 5000 gallons is carried in every load). LSU evaluation of the product stated that "no significant environmental hazard exists". The tanker trailers meet Department of Transportation requirements and discharge valves are replaced if any leakage is observed. Any minor spills during transloading from trailers to the honeywagon would be vacuumed up using the honeywagons suction apparatus. As long as the transfer site is not directly adjacent to a creek or other body of water, even catastrophic spills are not necessarily environmental impacts. Trailers are typically unloaded as they arrive at the Beneficial Use Site; this minimizes the possibility for vandalism.

B. ENVIRONMENTAL IMPACT COSTS VS. SOCIAL /ECONOMIC BENEFIT

The social and economic benefits of this beneficial use material application are greatly enhanced natural pasture grass production and quality. It also allows the elimination of a waste source stream from bulking up valuable landfill space. Our studies have shown no adverse environmental impacts.

The RSL Type II-A Process Plant causes the complete recycling of 99.5% of the input Grease Trap waste stream. We know of no other process plant in the entire country that achieves anything better than simply belt pressing the water out of the stream and hauling the material to a landfill. Additionally, the RSL facility is the only Grease Trap Waste operation in the state of Louisiana that is legally operating in compliance with DEQ regulations. The Beneficial use Facility is an integral part of that process. The use of the recovered organic material as a soil amendment typically increases biomass yield (grass for hay production) by a factor of four. The only alternatives to the use of the Beneficial Use Site would be to dispose of the material in a landfill at high cost and with absolutely no benefit to any part of society.

C. ALTERNATIVE PROJECTS TO THIS FACILITY

Since the existing Beneficial Use Permit was actually issued to the RSL Baton Rouge Type II-A Processing Plant and since no Beneficial Use facility of this type can exist without the Type II-A Processing Plant with the capabilities of Remediation Services of Louisiana's baton Rouge Plant, any discussion of alternatives must include the entire spectrum of Grease Trap waste Processing Alternatives. It must be capable of removing virtually all of the oil and grease from the solids stream. Alternate projects to this beneficial use application would be to deposit the material in a liquid waste approved landfill. Another alternative would be to bulk up the waste stream with sawdust or fly ash to allow it to pass the paint filter test and then deposit it in a conventional landfill. both of these scenarios involve utilizing scarce landfill space.

Alternate Beneficial Use Projects to be considered would involve either different application sites or different agricultural crops. Row crops that typically need additional nutrients of the type provided by this material could be a viable and economically attractive to pasture grasses; sugar cane looks like a particularly suitable option. Row crops do not offer the operational flexibility since the planting, fertilizing and harvesting involve a fixed cycle and are not a perennial crop as is grass. An application site closer to the production facility would reduce the environmental impacts associated with truck transportation. A site adjacent to a railroad spur could allow the environmental advantages of rail transport to be exploited.

An optimized possible solution would be to locate the Type II-A Process Plant in the middle of a one hundred acre Beneficial Use site located in a rural area. This concept could utilize the Beneficial Use Site as both a buffer zone to mitigate possible Process Plant odors and to utilize the organic material to fertilize a zoisa grass sod farm. The downside to this scenario would be the additional trucking required to bring the raw Grease Trap Waste to the remote location vs. the convenient downtown Baton Rouge location of the current RSL facility.

The following pages discuss alternative methods of handling the Grease Trap Waste stream and their relative environmental and economic costs.

C. *ALTERNATE PROJECTS to this FACILITY*

We can not think of any scenarios under which a facility which utilizes alternative currently available technology can offer more protection to the environment, regardless of the impact to non-environmental benefits.

The handling of copious amounts of fats, oils and grease waste is becoming a major problem facing POTW and Municipal Solid Waste Landfill operators. Extensive and costly removal of raw grease trap waste from municipal sewer systems and exacerbation of the environmental hazards of landfill leachate to the groundwater aquifers continue to exist. Increasing public emphasis on pollution reduction and the prospect of more stringent codes being legislated have created important implications for the pollution control industry.

Oil and grease handling is getting very sophisticated. In the past, you could simply dump it in one of many unlined small landfills or "pop a top" in a subdivision and dump it straight into the sewer system, or find a back road with a convenient ditch or stream and cut your overhead costs. The Office of Technology estimates that 60,000 landfills have closed since 1988. With the EPA's Subtitle D effective October, 1993, many of the remaining landfills have refused to take grease trap waste. In Louisiana alone, over 800 landfills have been closed, leaving the state with only 26 licensed operations. The promulgation of the Federal Government's 40 CFR 403 - "Protection of the Environment" has required most municipalities to submit pretreatment programs that address this waste stream. Wastewater treatment plant operators are recognizing the costly effects of ingestion of this waste and have joined with state and local officials to create new ordinances that require tracking, manifesting, generator responsibility, monetary fines, administrative orders, civil and criminal penalties, and a host of other controls that make handling of this waste a hot item.

The currently available options for grease trap waste disposal are: (Elaboration on each item included on following pages)

1. Accept this waste in our treatment plants, untreated.
2. Temporarily dry the waste with a bulking agent and bury it.
3. Apply the waste directly to the surface soil.
4. Develop technology to allow "in situ" treatment in the trap itself.
5. Develop technology to pretreat the waste and reuse what we can.

1. ACCEPTANCE OF UNTREATED WASTE INTO POTW SYSTEMS

We know that this grease, if ingested into a sewer system, will definitely accumulate at very low concentrations (<80 ppm) and create downstream blockages. If excessive detention time due to pipe blockages creates oxygen depletion, anaerobic conditions will generate hydrogen sulfide, methane gas and, if subsequently oxygenated, thiooxidanic organisms will form sulfuric acid in the liquid medium, all of which have a deleterious effect on the physical and economic life of the sewer system. In the case of the treatment plant itself, the result of this exposure is self evident. Most POTW operators will quickly attest to the nightmares caused by grease in their plant operating systems. Anaerobic treatment of wastewater containing fatty acids has been shown to be complicated by the inhibitious nature of significant concentrations of the long-chain carbon components of the grease waste (Hanaki et al., 1981; Koster & Cramer, 1987). These wastewater systems were never designed to accept this grease waste. They were designed to treat potty waste. Major components of grease waste reduce the crucial role played by methanogenic bacteria. If concentrations of the fatty acids exceed very low levels, the fatty acids, especially Lauric C-12:0, becomes toxic to these indigenous bacteria and the methane reactors in the treatment plant will be subject to a fatal inhibition (I.W. Koster, 1987).

Besides the obvious damaging effects chemically, biologically, and analytically, this particular waste has a significant economic impact on operating budgets of the wastewater plant and the maintenance of municipalities' infrastructure. In 1993, the city of Houston spent over $9,000,000 in direct contracts with outside vacuum/line cleaning services to remove plugged gravity lines, lift stations and forced mains from grease trap waste. The Department of Health and the Department of Public Utilities of Houston estimate that the real figure was in excess of $20,000,000 when all expenses to the city were recognized. The Harrison County Wastewater Commission in Gulfport, MS enacted stringent controls and enforcement methods to protect their sewer systems and have seen significant reduction in their operating budgets. Bottom line, economically.....grease trap waste management programs work and immediate savings to the city can be recognized in addition to the long term savings associated with the extended economic life of the treatment plants.

2. SOLIDIFICATION AND DIRECT BURIAL

When solidified and deposited in a Municipal Solid Waste Landfill, the components of the waste stream enter the world of microbial anaerobics. Under anaerobic conditions, fatty acids degrade as the result of a mutualistic relationship between the hydrogen producing fatty acid-oxidizing bacteria, acetogenisis or acid production, and the methane producing bacteria, methanogenisis or gasification. Each of these metabolic pathways produce new contaminants that cause concern for the MSW landfill operator.

First, to better understand the trauma to landfill systems, we need to explore the chemistry of commonly encountered fats and oils and their derivatives and their effects on traditional treatment systems. During the anaerobic breakdown of this material, volatile organic acids such as formic, acetic, propionic, and butyric (Tarwin and Buswell, 1934), to name just a few, are formed in substrates. Add to this the significant quantities of hazardous chemicals, i.e. pesticides, chlorinated and non-chlorinated hydrocarbons and solvents and organic automotive products such as oils, lubricants, and cooling fluids (Bomberger et al., 1987; Gapiniski, 1988) already deposited in the landfill, and the result is that the EPA Subtitle D landfills are attempting to contain, by a 60 mil HDPE liner plus 3 feet of compacted clay, a serious environmental threat to the groundwater aquifers. Unfortunately, recent studies reveal that even lined landfills leak (on the average of 13 penetrations per acre, according to Laine and Miklas, 1989) either due to faulty design, construction and/or cell loading which will result in groundwater contamination from landfill leachate (NUS Corp., 1988). Solvents and other volatile organic compounds are also formed in the degradation of medium and long-chain carbons, i.e., C-10 thru C-18, capric-linoleic fatty acids, which add to the problem of rapid migration of these compounds through flexible membrane liners even at diluted concentrations (Haxo and Lahey, 1988). Similarly, Johnson et al. (1989) proved that organic compounds will migrate through compacted clay liners. The use of a battery of acute and genetic toxicity bioassays, chemical analysis, and an estimated cancer risk calculation have shown that the leachate from MSW landfills, receiving primarily residential and domestic waste, is as acutely and chronically toxic as leachate from co-disposal and hazardous waste landfills such as Love Canal (Schrab, Brown and Donnelly, 1991). Add to this the impact of a contaminant that can create solvents and acids capable of destroying the environmental and structural integrity of these lined facilities and you have an issue that needs immediate attention. This is only part of the problem caused by the solidification of grease trap waste and subsequent burying.

The second part of the problem is the methane gas generation. Studies in California show that methane gas, at concentrations greater than 5% (the lower explosive limit), was found migrating off site underground at over 20% of the landfills. Significant off site methane migration was also found at 83% of the landfills. Municipal landfill methane gas releases thru 1990 have caused 10 deaths, hundreds of forced evacuations, and millions of dollars in plant, personnel, and property losses (Baker, L. et al., 1990).

Besides the acids and solvents produced, large amounts of methane gas is generated in the anaerobic degradation of the oil and grease. While there is a body of research that suggests that long-chain fatty acids are versatile inhibitors of methanogenic bacteria in wastewater treatment plants, several recent technical papers have been published in the journals that point to ever increasing problems due to methanogenisis in landfills. Key organisms in the conversion of these complex organic materials to methane are the H2- producing fatty acid-oxidizing bacteria. These organisms have a unique hydrogen acceptor system and are commonly referred to as methane formers. In the 30's, Buswell and Neave wrote the first formula that explained the anaerobic conversion of fatty acids to carbon dioxide and methane. While the chemical review of these metabolic pathways are rather complex, simply put, living organisms degrade the molecular structure of the complex grease molecule by hydrolysis of the ester linkage within the triglyceride structure via lipolysis and the byproducts, mainly free fatty acids, start the cycle. Use of such mechanisms as beta-oxidation, omega-oxidation, hydrogen acceptance and methane fermentation and organic chemistry terms mean that the degradation of the carbon structures of the saturated and unsaturated fatty acids produce organic acids, carbon dioxide and methane gas.

3. DIRECT APPLICATION TO SURFACE SOILS

Applying any liquid waste to the surface soil has become a touchy subject among regulators and environmental agencies. As we learn more about the delicate nature of our subsurface groundwater aquifers, it is becoming readily apparent that any liquid waste applied to the surface soil must be contained and treated or pretreated to levels of contamination that will not influence the water supply. The surface application of complex grease structures may degrade the short and medium-chain saturated fatty acids with low carbon structures such as acetic C2:0, butryic C4:0, caproic C6:0, caprylic C8:0, and lauric C10:0, but the long-chain carbon structures, both saturated and unsaturated, through linolenic C18:3 will take a long time to degrade as we would expect since the even longer-chained carbons, i.e., hydrocarbons, have been around for millions of years.

If the direct surface application disposal site overcomes the negative impact on the subsurface aquifers, the next problem it will face is the odor. As grease trap waste decomposes, the odors are horrific. This putrescible waste, defined as organic waste that is capable of being decomposed by microorganisms with sufficient rapidity as to cause odors or gases, or is capable of providing food for, or attracting, birds, animals, and disease vectors, will become a major objection to any resident in the surrounding area. Control of this odor is becoming an insurmountable problem when associated with direct land application without pretreatment. Neutralizing the hydrogen sulfide emissions, the rotten egg smell, is a time consuming and expensive proposition that requires additional physical plant equipment and retention time which equates to treatment too expensive to be factored into the ongoing operation of a surface application.

4. IN-SITU TREATMENT BY BIOAUGMENTATION

Classical bioaugmentation of grease traps was the buzzword of the late 70's and even thru the mid-80's. There were numerous papers presented on the subject which led everyone to believe that by introduction of certain strains of bacteria or augmentation by enzyme loading, we would never have to worry about pumping out a grease trap again, and that would obviously solve any problems associated with a final disposal site. The only problem with this approach was that after a very short period of treating time, the grease traps started passing untreated contaminants due to system overloads. All across the country, city after city noticed that their treatment plants were clogging, the field lines were plugged, and long runs of their gravity lines were so blocked that major expenditures were necessary to dig up entire sections of their systems and replace the clogged pipes. The in-situ treatment would simply enhance indigenous bacteria's activity and the shorter-chain fatty acids would degrade rapidly. The long-chain complex carbon molecules could only be emulsified or partially degraded to prevent a top cake from forming and the majority of the grease simply reformed further downstream in the sewer treatment system.

Papers presented to various wastewater groups around the country explained in great detail the theory of bioaugmentation. The rational behind their claims was solid. The problem occurred when the long-chain fatty acids started showing up in greater volumes, currently as much as 60% of the total concentration. The fatty acids that predominate in a grease trap are these same long-chain fatty acids. With an in-situ treatment, larger molecules are only partially broken down and will accumulate on sewer walls and quickly create blockages. Enzyme additives, while often useful in accelerating a chemical reaction, have no ability to affect the complete degradation of these fatty acids.

The degradation of high molecular weight fatty acids is a very complex pathway requiring seven or eight cycles, each of which involves seven separate but coupled enzymatic steps. Simple additions of a few enzymes cannot duplicate bacterial degradation. Only a living organism can successfully carry out a complete mineralization of these compounds.

The controversy and confusion over "State of the Art" bioaugmentation as a final solution rested squarely on the shoulders of the old adage, "If it appears too good to be true, then it probably isn't". "Bio-expert" firms sprang up everywhere with little or no technical know-how and offered all sorts of products, some good, but mostly bad, with exaggerated claims that could not possibly be fulfilled. Their arsenal of cheap fixes were formidable. Magic words like biocatalytic converters, preserved bacteria formulations, enzymic preparations, extracts from plants and animal by-products, and all sorts of "fu-fu" dust flooded the market and found a warm reception from the restaurateurs who really didn't understand the service or had the time to properly research other options. Many municipalities have currently outlawed the use of in-situ treatment of grease traps simply because of insufficient retention time and solvents or chemicals that pass the untreated waste downstream. Then the POTW must deal with the recollection and cumulative deposits that have simply passed through the grease interceptor. The purpose of the interceptor has been eliminated and the trap may appear clean, but again, the POTW operator is burdened with the same raw waste.

5. PRETREATMENT PROCESS PLANTS

Process plants capable of pretreating these liquid waste streams are the most economical and environmentally responsible method to deal with grease trap waste. As the groundswell of new regulations tighten all across the board, from NPDES surface water discharge levels to monitoring of leachate and surface water runoff, from pretreatment requirements at the effluent discharge point from restaurants into POTW systems, to groundwater monitoring of the EPA Subtitle D landfills, the responsible authorities are beginning to realize that a void exists for proper disposal of liquid wastes that heretofore have been considered a nuisance waste. Whether this waste is prevented from entering sewer treatment systems by rigid enforcement of tracking systems and paper trails or prevented from bulking up valuable cubic feet in limited solid waste landfills, will be determined by changes to the perceived and real affects of the legal disposal of grease waste. Recapture, recycle, and reuse are the future direction of solid and liquid waste mitigation, and only new technology involving the handling and processing can be targeted as a solution.

As Carol Browner, EPA Director, recently said, "It makes better sense to prevent a waste from entering a system than to try and remove it later". This applies to every current method of grease waste disposal except processing. In each case the contaminant will have to be removed, at a much greater expense, than be eliminated by proper pretreatment, mitigation and subsequent disposal.

In summation, we need to review the available options that will solve the oil and grease problem for the POTW and landfill operator. Equally as important is the need to realize that the generator of this waste, the restaurants, hospitals, prisons, nursing homes, cafeterias, and a host of other responsible corporate citizens, will be impacted economically. Cures to this problem that kill the patient financially will never by tolerated. We must balance the cost of legal disposal with the ability of the restaurants to realistically increase their operating budgets. In most cases the difference between legal, environmentally sound disposal, and irresponsible disposal is nominal. The food service industry in Louisiana is the second largest employer in the state and deserves the respect and support of all service companies. As new solutions to old problems evolve, careful attention must be paid to the delicate balance between the ability to continue doing business, and protection of our vast metropolitan infrastructure as well as the environment. Only a short time ago, disposal of these liquid waste streams was readily available in the form of a landfill; however, current regulations make finding such disposal sites very difficult. Landfill disposal problems will grow as more environmental restrictions are imposed by government and new regulations are further tightened to protect the irreplaceable groundwater aquifers. It is thus crucial that a cost effective, viable alternative to the traditional method of fats and fatty acids waste disposal be found. We must find a mutually acceptable solution that does not significantly increase costs to the restaurant nor their "cradle to grave" disposal responsibility while preventing any aggravation to the receiving sewage collection system and the environment.

D. ALTERNATE SITES for this FACILITY

This facility was built and evolved over a several year period on the site of a previously existing failed waste processor. While none of the equipment involved in the current operation existed under the previous owners, the original intent was to build upon and refine the existing process. We now know that optimal location characteristics for locating this type of facility include:

- Proximity to sources of grease trap waste.

- Access to a relatively large capacity sanitary sewer system.

- Proximity to property suitable for beneficial use applications.

- Access to transportation infrastructure.

- Sufficient land to isolate the plant from neighbors, discussing each characteristic individually, and how the current plant compares with an ideal situation facility;

- The downtown Baton Rouge site is very convenient for all the local pumpers since the vast majority of their customers are in the metropolitan area. Transportation costs can easily become excessive for such a low value commodity as hauling distances increase. Thus the current location is ideal for Baton Rouge generated grease trap waste, but less favorable for New Orleans, Shreveport, and out of state product.

- Baton Rouge has an efficient and well managed POTW system. The volume of treated water which we discharge into the sanitary sewer has no deleterious effect on the system. In fact, the active bacteria and oxygenated water increase the operational efficiencies of the POTW.

- The solids stream that we generate has been proven to have legitimate soil enhancing qualities. We are currently trucking this product to an application site 37 miles from the plant. Like the raw grease trap waste, transportation costs quickly become excessive for a commodity with a relatively low value per pound. The ideally situated facility would apply the beneficial use material on property adjacent to the plant. We are investigating other application sites closer to Baton Rouge which might benefit agriculturally from this material.

- The current facility is well situated to take advantage of existing transportation infrastructure. Local traffic can utilize four lane roadways to within one half mile of our site. Other traffic utilizes the interstate system (we are located within one and one half miles of exit 1E of Interstate 110). The site also bounds an interchange track connecting the Kansas City Southern and Illinois Central Railroads. A spur track could be relayed (it was removed some years ago) if volume warrants rail car size shipments. The current location would be considered near ideal in this criteria.

- The facilit~~ie~~y's five acre site in an industrialized area is sufficient for the expected eventual local volume, but the urban location makes air pollution concerns more critical than expected. While any emissions would be non-toxic, odors can be present under certain conditions. Air emission regulations for nuisance odors only require testing and compliance at property lines, so natural dissipation would virtually eliminate any odor concerns if the site were located on a large parcel in an unpopulated area. Our current location's only drawback is that it forces us to adhere to stricter housekeeping measures.

E. MITIGATING MEASURES THAT COULD OFFER MORE ENVIRONMENTAL PROTECTION

As discussed earlier, the currently existing facility is the result of a continuous evolutionary process which, from the start, endeavored to recycle as much of the grease trap waste components as possible. The only potential environmental impacts that this facility has are non-toxic nuisance odors. The current facility has addressed this issue with permanent steel process equipment and piping, as well as with housekeeping procedures. In an idealized concept, the entire operation would be performed in an enclosed building that utilized forced air ventilation and then consumed the process exposed air in the boiler combustion and aerobic digestion blowers. Use of activated charcoal scrubbers could also be investigated. Future RSL plant projects would utilize the lessons learned at this facility, and would, no doubt, offer environmental, as well as operational efficiency improvements to our current process.

B. CERTIFICATION

"I have personally examined and am familiar with the information submitted in this document and all attachments thereto, and I certify that, based on a reasonable investigation, including my inquiry of those individuals responsible for obtaining the information, the submitted information is true, accurate, and complete to the best of my knowledge and belief."

"I understand that a false statement made in the submitted information may be punishable as a criminal offense, in accordance with LA. R.S. 30:2025(F) and in accordance with any other applicable statute."

Brian R. Helms, P.E.
Engineering Manager - RSL.

C.

Upon approval of this application, RSL shall handle, process and store the described material in a manner and management in accordance with the proposed plan outlined in this application.

D.

This subsection does not apply because while we are operating under an existing Beneficial Use Permit, we are hereby applying for a new Permit under the new regulations.

E.

This subsection does not apply because this permit application does not involve the pulp and paper industry.

SECTION 525 SOLID WASTE FEES

PERMIT REVIEW FEE (525.B)

Applicants for Beneficial Use Permits shall pay a permit application review fee of $660 and the fee shall accompany the permit application submittal. RSL has made payment to the Louisiana Department of Environmental Quality in the amount of $660. as a part of our permit renewal submitted on May 30, 2006.

Vendor ID	Name	Payment Number	Check Date	Check Number
LADEQ	Louisiana Department of Environmen	00000000000000090	6/15/2006	1074

Invoice Number	Date	Amount	Amount Paid	Discount	Net Amount Paid
PER20060001	6/7/2006	$160.00	$160.00	$0.00	$160.00
		$160.00	$160.00	$0.00	$160.00

1074

RSL ACQUISITION COMPANY LLC
P.O. BOX 1007
KENNER, LA 70063-1007

HIBERNIA NATIONAL BANK
NEW ORLEANS, LOUISIANA 70161
14-9-650

One Hundred Sixty Dollars And 00 Cents

DATE	AMOUNT
6/15/2006	$160.00

PAY TO THE ORDER OF

Louisiana Department of Environmental Quality
P.O. Box 4313
Baton Rouge LA 70821-4313

MP

⑈001074⑈ ⑆065000090⑆ 208 05⑈9879 0⑈

SECTION 525 SOLID WASTE FEES

PERMIT REVIEW FEE (525.B)

Applicants for Beneficial Use Permits shall pay a permit application review fee of $500 and the fee shall accompany the permit application submittal.

RSL ACQUISITION COMPANY LLC

1043

Vendor ID	Name	Payment Number	Check Date	Check Number
LADEQ	Louisiana Department of Environmen	00000000000000041	6/1/2006	1043

Invoice Number	Date	Amount	Amount Paid	Discount	Net Amount Paid
060106	6/1/2006	$500.00	$500.00	$0.00	$500.00
		$500.00	$500.00	$0.00	$500.00

1043

RSL ACQUISITION COMPANY LLC
P.O. BOX 1007
KENNER, LA 70063-1007

HIBERNIA NATIONAL BANK
NEW ORLEANS, LOUISIANA 70161
14-9-650

Five Hundred Dollars And 00 Cents

DATE 6/1/2006

AMOUNT $500.00

Security Features Included. Details on back.

PAY TO THE ORDER OF

Louisiana Department of Environmental Quality
P.O. Box 4313
Baton Rouge LA 70821-4313

MP

⑈001043⑈ ⑆065000090⑆208 06⑈98790⑈

Louisiana State University
Agricultural Center
Louisiana Agricultural Experiment Station

G. A. Breitenbeck

January 31, 1996

Richard W. Lancaster
President/CEO
Remediation Services of America, Inc
1225 Neosho Ave
Baton Rouge, LA 70802

On the basis of our laboratory, greenhouse and field evaluations of the organic byproducts generated during recycling of grease trap wastes by Remediation Services of America, we find that use of these organic byproducts to enhance the fertility of pasture land constitutes a legitimate beneficial use of this solid waste that is not likely to cause health or nuisance concerns. No toxicities, odor problems or other adverse effects of using this by-product as a source of crop nutrients and as a soil conditioner were evident when the materials was injected below the soil surface. On the contrary, injection of this slurried organic by-products into bahiagrass pasture significantly increased yields and hay quality. It is very likely that this material would be equally effective for row crops, especially when injected in combination with reduced rates of inorganic fertilizers.

Sincerely,
G.A. Breitenbeck

G. A. Breitenbeck,
Professor

Agronomy Department 104 M. Sturgis Hall Baton Rouge LA 70803-2110 (504) 388-1362 FAX (504) 388-1403

BEECHGROVE PLOT CHART

Each cell has the following dimensions:
Area - 2.30 acres
Length - 1000 feet
Width - 100 feet
Lanes - 4 @ 25 feet wide
Runs - 4 Per Lane

There will be a total of 32 cells in the plot. A random drawing will determine the loading for each cell. The following are the loading rates for each cell:

UNFERTILIZED

These cells will not be used for application purposes. They will serve as control units.

5% LOADING

8,100 Gallons Per Acre
18,630 Gallons Per Cell
4,657.5 Gallons Per Lane
1,164 Gallons Per Run

10% LOADING

16,200 Gallons Per Acre
37,260 Gallons Per Cell
9,315 Gallons Per Lane
2,328.75 Gallons Per Run

20% LOADING

32,400 Gallons Per Acre
74,520 Gallons Per Cell
18,630 Gallons Per Lane
4,657.5 Gallons Per Run

MC:1/6/95.

RSL - BEECHGROVE PLANTATION / FIRST CUTTING

CELL #	APPLICATION RATE	# OF BALES
1	CONTROL	3
2	20%	13
5	20%	13
6	5%	9
9	20%	14
10	5%	8
13	10%	11
14	CONTROL	4
17	10%	13
18	10%	10
21	10%	9
22	CONTROL	4

Cuttings were performed during the third week of September 1995. At this point planned application rates had not yet been achieved on the grids located on the eastern side of the site (cells 3,4,7,8,11,12 etc.)

Clipping Samples from August 9, 1995

Sample #	Date	Time	Cell #	Application Rate	Weight
1	8/9/95	10:35 AM	1	CONTROL	12.80 oz
2	8/9/95	11:10 AM	5	20%	31.85 oz
3	8/9/95	11:20 AM	9	20%	35.85 oz
4	8/9/95	11:35 AM	13	10%	28.85 oz
5	8/9/95	11:45 AM	17	10%	27.60 oz
6	8/9/95	11:50 AM	21	10%	23.40 oz
7	8/9/95	12:05 PM	25	5%	19.35 oz
8	8/9/95	12:15 PM	29	10%	32.60 oz

Samples collected by: Dr. Gary Breitenbeck , LSU Agronomy Department, and Michael Clement, RSL Lab Manager.

Samples were dried for twelve days in RSL's warehouse.

Weighing performed by Michael Clement.

Average empty bag weight of 1.7 oz was subtracted from the gross weight of each bagged sample to to calculate net sample weights.

Assessment of the Agricultural Benefits of Amending Soils with Various Organic Wastes Generated by Remediation Services Of Louisiana, Inc.

Report prepared by:

Dr. G. A. Breitenbeck
Agronomy Department
Louisiana State University Agricultural Center
Baton Rouge LA 70803-2110

July 27, 1994

SUMMARY

Greenhouse and laboratory studies were performed to assess the agricultural benefits of using sludge generated by hRemediation Services of Louisiana, Inc. (RSL) as a soil amendment. This sludge is generated during the reclamation of grease trap wastes. Preliminary studies were also conducted to determine the suitability of two additional waste streams as soil amendments: the contents of RSL's "day tank" and "cooking tub". The data collected indicate that these wastes may be used beneficially in agriculture as a source of plant nutrients and as a soil conditioner.

Incorporation of as much as 1.2" of the slurried sludge into 6" of soil (~160 cubic yards/Ac) caused no phytotoxicities and markedly improved growth of bermudagrass. Addition of 5% sludge (vol/wt.) fully met crop demands for P, K and S but did not provide sufficient N for optimum biomass production. Greenhouse studies suggest that more than 2.5" of sludge may be applied before exceeding the capacity of bermudagrass to assimilate the added N. Amending soil with sludge did not influence the uptake of micronutrients or heavy metals.

In addition to providing crops with nutrients, addition of sludge improved the physical condition of soil. Bulk densities were reduced and water infiltration rates were substantially increased. Sludge stimulated the overall activity of soil microorganisms.

Because this sludge contains substantial quantities of readily decomposable organic matter, addition of large amounts to soil results in temporary immobilization of plant nutrients. Immobilization may have caused the observed delay in seedling germination in sludge amended soil. In practice, this limitation can be easily overcome by allowing a delay of one to two weeks before planting into sludge amended soils.

Our principal management concern relates to the unwholesome odor the sludge slurry rapidly develops after its removal from the aerobic digester. The specific causes of this odor were not identified, but the unusually high amounts of sulfur in this sludge suggest that volatile organic S compounds are responsible. Laboratory experiments indicated that covering the sludge with 2" of clay soil or 3-4" of silt loam completely contained odors. Also, mixing the sludge in ratios of 1 part sludge to 5 parts dry clay loam or 15 parts sandy loam soil contained odors. These findings suggest that odor problems can be avoided by application techniques that bury this sludge in shallow furrows or rapidly mix it into the surface soil by harrowing, etc.

"Cook tub" and "day tank" wastes were not fully evaluated as soil amendments, but chemical analyses suggest that they may also be effective as soil conditioners and as a source of plant nutrients. A longer delay between application and planting (2-4 weeks) is advisable to ensure that these materials to not inhibit crop development due to temporary immobilization of crop nutrients.

On the basis of these greenhouse and laboratory studies, it is our general conclusion that the application of the slurried sludge generated by RSL to agricultural soils constitutes a legitimate beneficial use and poses no significant environmental hazard. Application rates of as much as 300

cubic yards/Ac/yr to bermudagrass are not likely to result in excessive accumulations of nitrate provided that hay is harvested and nutrients continuously removed from fields. Caution should be exercised to ensure that high application rates do not exceed the capacity of soils to retain this slurried material and do not result in runoff into nearby waterways. Application techniques that contain odors will be necessary where odors pose a nuisance to residents.

CHEMICAL ANALYSES

Purpose: Three wastes generated during the reclamation of grease trap wastes were analyzed to determine the amounts of plant nutrients and potentially harmful metals contained in these materials.

Experimental: Representatives samples of three wastes (sludge, "day tank", and "cook tub") were provided by RSL. These materials were stored at 4°C until use in these experiments. Subsamples were separated into solids and liquids by centrifugation and these fractions analyzed independently. Ash content was determined by loss on ignition of material at 550°C. Organic C and total N were determined by a dry combustion technique using a automated CHN analyzer. Extractable NH_4 and NO_3 were determined using an automated ion diffusion technique. Other elements were determined by ion-coupled plasma spectrophotometry of nitric-perchloric acid digests of solid and liquid fractions. Triplicate analyses were performed using replicate samples of each waste.

Results:

Sludge

- The sludge contained about 15.1% solids comprised of 43.5% C, 4.5% N, 0.7% P, and 0.8% K. The concentrations of other elements and the lbs of various components contained in a cubic yard of sludge slurry are shown in Table 1. These solids also contained an unusually high amount of S (800 mg/kg), presumably derived from amino acids and other organic S compounds.
- A cubic yard of sludge slurry was estimated to contain 0.46 lbs N as NH_4^+ or NO_3^- and an additional 10.5 lbs as organic N. The presence of NH_4^+ or NO_3^- may be due to the fact that containment of the sludge in sealed containers limited microbial activity. Temporary immobilization of these N forms is likely to occur once the material is applied to soils (see mineralization studies).
- With the exceptions of Fe and Zn, metal concentrations did not exceed those typical of Louisiana soils.
- Both the solid and liquid fractions contained high concentrations of soluble salts. The molar ratio of Ca to Na was very low (0.7:1). A Ca:Na molar ratio of at least 5:1 is generally desirable.

Day Tank and Cook Tub

- Day tank and cook tub slurries contained more organic solids than did activated sludge. Higher C:N ratios (15.9:1) suggest that microorganisms have not exhausted the energy available in organic components and therefore a greater potential exists for immobilization of plant nutrients.
- Salts and pH were lower than in sludge.

Table 1. Composition of three organic materials in the waste stream generated during grease trap recycling.

Property	Sludge Solids	Sludge Liquids	Slurry lbs/cu. yd	Day Tank Solids	Day Tank Liquids	Slurry lbs/cu. yd	Cook Tub Solids	Cook Tub Liquids	Slurry lbs/cu. yd
% of total (wt/wt)	15.1%	84.9%		27.1%	72.9%		23.3%	76.7%	
% ash	27.5%	nd		27.6%	nd		13.8%	nd	
pH	5.91	5.84		4.91	4.94		4.82	4.85	
Organic C (%)	43.1%	0.2%	104.8	43.7%	0.7%	185.3	60.5%	0.7%	230.6
Total N (%)	4.5%	0.02%	10.9	2.7%	0.0%	11.7	3.3%	0.0%	12.5
C:N ratio	9.6	9.6		15.9	15.9		18.5	18.5	
NH4-N (mg/kg)	1205	119	0.44	821	226	0.58	271	141	0.27
NO3-N (mg/kg)	56	6	0.02	0	8	0.01	7	4	0.01
P (mg/kg)	700	28	0.20	1097	17	0.47	271	28	0.13
K (mg/kg)	792	99	0.32	286	117	0.24	119	32	0.08
S (mg/kg)	801	200	0.45	138	34	0.09	694	27	0.29
Ca (mg/kg)	6178	545	2.18	415	1109	1.38	672	283	0.59
Mg (mg/kg)	314	31	0.11	108	59	0.11	43	11	0.03
Na (mg/kg)	5086	742	2.18	504.5	256.0	0.49	670.0	196.8	0.48
As (mg/kg)	11.7	0.0	0.00	10.9	0.1	0.00	5.5	0.1	0.00
Cd (mg/kg)	0.1	0.0	0.00	1.8	0.0	0.00	0.7	0.0	0.00
Cu (mg/kg)	2.7	0.0	0.00	24.0	0.0	0.01	42.2	0.0	0.02
Fe (mg/kg)	536.3	64.9	0.21	137.1	288.1	0.37	196.4	48.1	0.13
Mn (mg/kg)	46.4	2.5	0.01	11.9	3.3	0.01	8.7	1.4	0.00
Ni (mg/kg)	5.3	0.0	0.00	3.7	0.0	0.00	3.6	0.0	0.00
Pb (mg/kg)	2.8	0.0	0.00	18.0	0.0	0.01	10.8	0.0	0.00
Zn (mg/kg)	91.6	0.1	0.02	116.5	0.1	0.05	153.2	0.9	0.06
Salts (mg/kg)	22312	4013	10.6	4863.5	3894	6.2	4896.5	1815	4.0
Conduct. (μmhos)	7225	6080		1475	5900		1485	2750	

Nitrogen Mineralization

Purpose: N mineralization was monitored to determine the extent and duration of nutrient immobilization following the addition of wastes to soils.

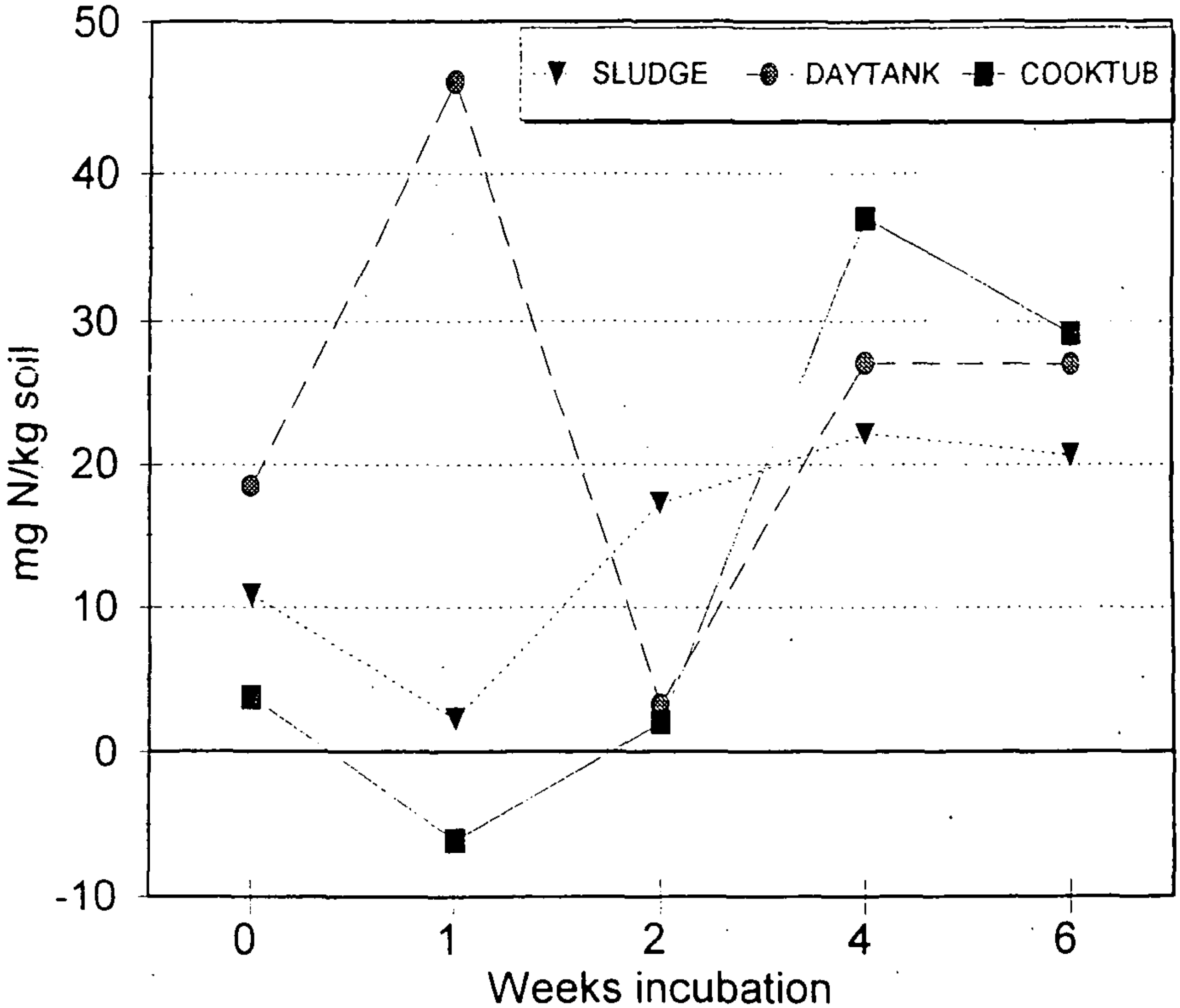
Experimental: Samples of sandy loam soil (100g) were amended with 10 ml of sludge, day tank and cook tub slurries and placed in 70-mm diameter Buchner funnels fitted containing #52 Whatman filter papers. Soils were leached with 100 ml aliquots of CaCl (0.01 M) after 0, 7, 14, 28 and 42 days of incubation (25°C; 0.2 bars tension). The amounts of NH_4^+ and NO_3^- in leachates were determined using a automated ion diffusion technique. Net mineralization was calculated as the difference between the amounts of extractable inorganic N in leachates obtained from sludge amended and from unamended soil samples. Experiments were performed in duplicate.

Results:

- Fig. 1 shows the net N mineralization due to amending soil with 10% (vol/wt) slurries obtained from aerobic digestor (sludge), day tank and cooking tub.
- Sludge and cook tub wastes behaved similarly although the slurry obtained from the cooking tub required longer incubation before net N mineralization was evident. Day tank wastes displayed an initial rapid mineralization followed a period of immobilization.
- These findings suggest that when soil conditions support vigorous microbial activity, a period of two weeks is required before significant mineralization of sludge occurs. A delay of 3-4 weeks is advisable after addition of day tank or cooking tub wastes to avoid immobilization of plant nutrients. Longer periods will be required when microbial activity is limited by low soil temperatures, high moisture contents or other adverse environmental conditions.

Fig. 1. Net N mineralization

Soil amended with 10% wastes (vol/wt)



Seed Germination

Purpose: The effects of various amounts of sludge on seed germination were studied to identify possible toxicities or inhibitions.

Experimental: Samples of sandy loam soil (25 g) were amended with 0, 2.5, 5.0 or 12.5 ml of sludge and placed in 5.5 cm petri dishes. Moisture contents were adjusted to near saturation. Twenty tomato seeds were pressed into the soil surface of dish and the dishes incubated in the dark at 25°C . Tomato seeds were used because of their sensitivity to those soil conditions adverse to plant development. The number of emergent seedlings were counted after 7, 14 and 21 days.

Results:

- Table 2 shows that amending soils with sludge delayed seedling germination for at least 7 days. The percentages of seedlings emerged after 21 d in sludge amended soils were significantly less than in unamended controls. The adverse effects of this sludge were more apparent in soil amended with 50% sludge than in soil amended with lower amounts.
- The inhibitory effects of this sludge on tomato seed germination may have been caused by immobilization of N and other plant nutrients. In a subsequent greenhouse study where sludge was incorporated into soil 14 days prior to planting bermudagrass seed, no adverse effects on seed germination were evident.

Table 2. Tomato seed germination in a sandy loam soil amended with sludge .

Sludge added (vol/wt)	% seed germination		
	7 days	14 days	21 days
0%	90%	90%	90%
10%	0%	64%	68%
20%	0%	53%	67%
50%	0%	33%	58%

Greenhouse Trials

Purpose: The fertilizer value of sludge was determined in a greenhouse study where responses of bermudagrass to various application rates of sludge were compared with those obtained by applying various combinations of inorganic fertilizers to establish the fertilizer value of this waste.

Experimental: The capacity of this organic waste to supply nutrients to plants was evaluated in greenhouse trials where the responses of bermudagrass to 1%, 5%, 10%, 20% (vol/wt) of RSL's sludge slurry were compared to responses to four rates of inorganic N (0, 50, 100 and 150 mg N/kg), three rates of P (0, 50 and 100 mg P/kg) and three rates of K (0, 50 and 100 mg K/kg) applied in a factorial design. Sludge was applied on a volume rather than dry weight basis to allow convenient extrapolation to obtain field application rates (Table 3). The specific amounts of selected components added to pots receiving various rates of sludge are shown in Table 4. Treatments were applied to 2.00 kg sandy loam soil in 6-in. dia. pots 14 days prior to seeding bermudagrass. Plants were grown for 10 weeks in a greenhouse equipped with an automated overhead irrigation system adjusted to maintain adequate moisture for optimum growth and to avoid excessive watering that would result in leaching of nutrients from pots. All treatments were established in triplicate.

The above ground biomass was harvested 6 and 10 weeks after planting. Dry weight, N% content and total N uptake was determined for sample from each pot. Total N was determine by an automated dry combustion technique using a CHN analyzer. The elemental composition of the biomass samples of selected treatments were determined by ICP analysis of nitric acid digests.

Results:

- All rates of sludge application to bermudagrass resulted in significantly greater biomass production than obtained from unfertilized controls (Table 5).
- A greater percentage of total growth was obtained from the second cutting of pots receiving sludge than was obtained from pots receiving inorganic sources of nutrients. This suggests that sludge behaves similar to slow-release forms of fertilizer and would be especially valuable in situations where N fertilizers are subject to loss via leaching or denitrification.
- Biomass production in pots receiving 20% sludge (160 cubic yards/Ac) was not as great as in pots receiving the optimum amounts of inorganic fertilizers (150 mg N, 50 mg P and 50 mg K/kg). Apparently, even this high rate of application did not fully satisfy the N demands of bermudagrass. N contents of leaves indicated that application of 20% sludge was equivalent to applying 65 mg NH_4NO_3-N/kg or approximately 200 lbs fertilizer N/Ac. Optimum yields of bermudagrass were obtained by application of more than double that amount of inorganic N fertilizers in this greenhouse study.
- Figure 2 shows the fertilizer N efficiency of sludge applied at various rates. Efficiency was greater were lower amounts of sludge were applied, but even at higher application rates plant uptake of sludge-derived N accounted for more than 4% of total N applied. Plants were growing vigorously at the end of this study and therefore it can be assumed that under

Louisiana's long summer growing season the efficiency would be greater than the values in Fig. 2 indicate. Where excessive N fertilizer is to be avoided, a conservative estimate of 6-8% efficiency of applied N should be used when estimating application rates. For example, applying 100 cubic yards of sludge containing 10.9 lbs total N/cubic yard can be considered equivalent to applying 65 to 87 lbs inorganic fertilizer N.

- Analyses of the elemental composition of the above ground biomass indicated that application of sludge at rates of 5% or more significantly increased plant uptake of P, K, and S (Table 6). Application of sludge at rates of 10% or more fully satisfied plant demand for these nutrients.

- Sludge application did not significantly influence uptake of Ca, Mg, micronutrients or heavy metals. Sodium concentrations in plants receiving sludge were greater than in unfertilized plants, and concentrations tended to increase with increasing rate of sludge application. It is not advisable to apply this sludge to soils were Na accumulation is a problem, such as in the irrigated regions of the Macon Ridge in Louisiana.

- In summary, RSL's sludge appears to be an excellent source of N, P, K and S. N was the most limiting nutrient when this sludge was used for growing bermudagrass, a crop with a high demand for N. No adverse effects of amending soils with as much as 20% sludge were evident in this greenhouse trial. Sludge did not increase heavy metal uptake by bermudagrass.

Table 3. Approximate field application rates extrapolated from greenhouse rates.

Rate (vol/wt)	Inches applied to soil surface	Cubic yards per Acre	Solids	Mineral	Org. C	Total N	Salts
			lbs/Ac				
1% sludge	0.06	8.1	1910	574	849	89	86
5% sludge	0.3	40.3	9503	2857	4223	441	426
10% sludge	0.6	80.7	19053	5722	8466	884	854
20% sludge	1.2	161.4	38058	11444	16312	1765	1705

Table 4. Amounts of various components added to pots amended with 1, 5, 10 or 20% sludge slurry.

	(g/pot added)			
Component	1%	5%	10%	20%
Wet Wt	20.14	100.70	201.40	402.80
Solids	3.05	15.25	30.49	60.98
Liquids	17.00	85.00	170.00	340.00
Org. C	1.35	6.77	13.55	27.10
N	0.14	0.70	1.41	2.82
P	0.00	0.01	0.03	0.05
K	0.00	0.02	0.04	0.08
S	0.01	0.03	0.06	0.12

Table 5. Effects of applying RSL sludge and various amounts of inorganic N and P on biomass, tissue N concentrations and total N uptake by bermudagrass

Treatment †	1st cutting (6 wks)			2nd cutting (10 wks)			Both cuttings		
	Biomass (g)	Total N%	N (g/pot)	Biomass (g	Total N%	N (g/pot)	Biomass (g	Total N%	N (g/pot)
1% sludge	2.17	1.48	0.032	3.37	0.67	0.022	5.54	0.99	0.055
5% sludge	3.04	1.56	0.047	3.18	0.78	0.024	6.23	1.14	0.071
10% sludge	3.25	1.80	0.059	3.52	0.86	0.030	6.76	1.31	0.088
20% sludge	3.67	2.26	0.082	5.54	1.02	0.056	9.20	1.51	0.139
Control	1.00	1.34	0.013	2.63	0.60	0.015	3.63	0.80	0.028
Optimum	10.81	3.28	0.355	6.93	1.10	0.075	17.74	2.50	0.444
	Main effects of application of various levels of inorganic fertilizers								
0 N	0.89	1.39	0.012	1.80	0.77	0.013	2.69	0.96	0.026
50 N	4.37	1.80	0.080	3.59	0.85	0.029	7.97	1.37	0.110
100 N	6.18	2.46	0.154	4.53	1.00	0.045	10.71	1.81	0.199
150 N	6.62	2.63	0.177	5.17	1.07	0.057	11.79	1.93	0.234
0 P	2.49	2.05	0.058	3.40	0.89	0.034	5.88	1.38	0.091
50 P	5.71	2.02	0.134	4.01	0.93	0.038	9.72	1.56	0.172
100 P	5.35	2.13	0.127	3.91	0.94	0.036	9.26	1.61	0.163

†Control, no fertilizers added; Optimum, pots showing highest average biomass production (150 ppm N, 50 ppm P, 50 pp

Fig. 2. Efficiency of N uptake

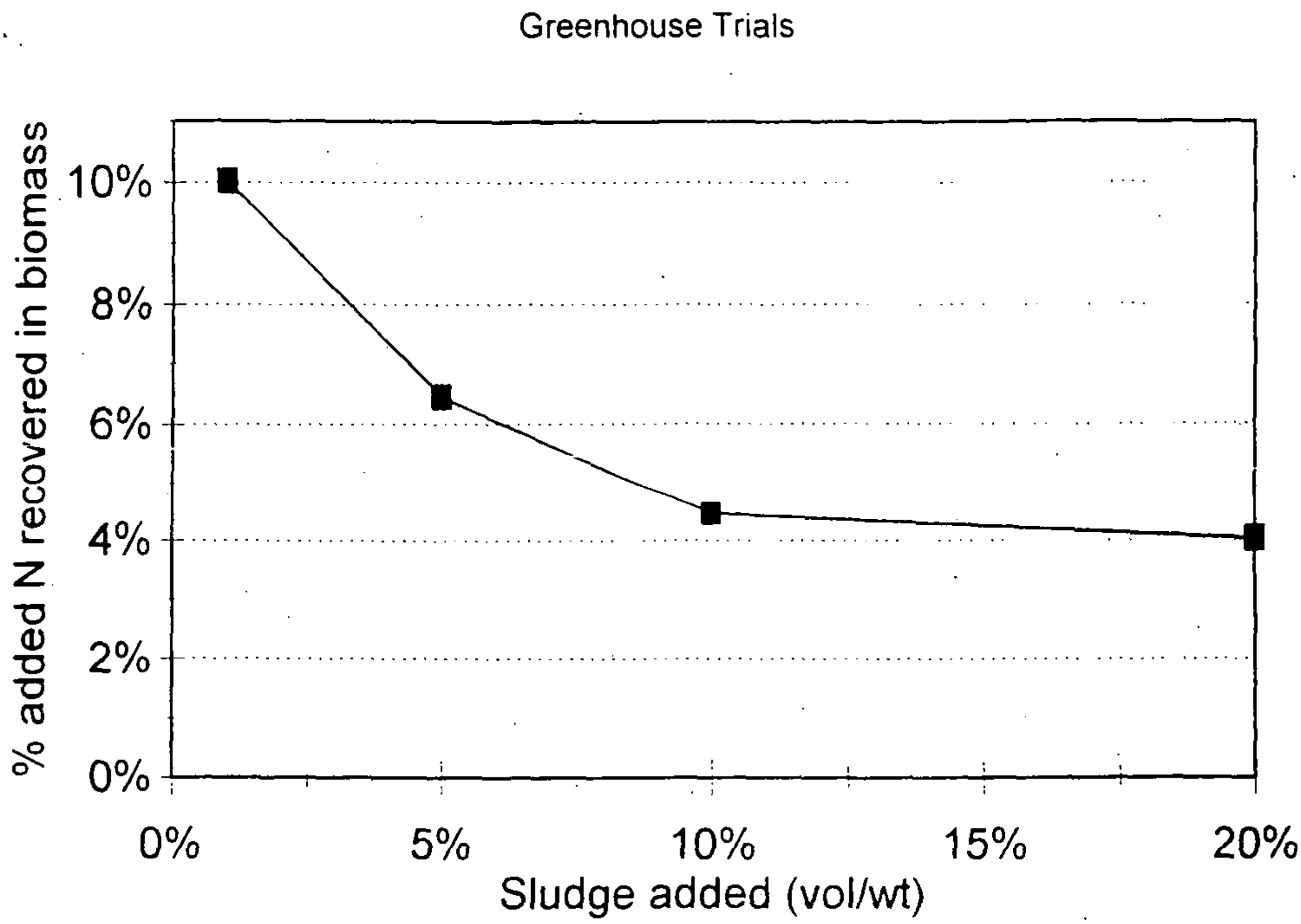


Table 6. Effects of applying RSL sludge and various levels of inorganic N and P on the ele composition of above ground biomass.

Treatment †	P	K	S	Ca	Mg	Na	Al
	mg/kg						
1% sludge	2419	27258	2386	6956	3269	6424	178.1
5% sludge	3211	28920	2310	6348	2678	6789	144.7
10% sludge	4275	31241	2969	6242	2796	7555	205.2
20% sludge	4906	32334	3285	6480	2556	8916	110.8
Control	2149	22243	1868	8104	3248	5511	213.2
Optimum	3875	29017	2698	5704	2760	8099	107.9
lsd (0.05)	1255	5549	970	1302	ns	ns	ns

Treatment †	Fe	Mn	Zn	Cu	Co	Ni	B
	mg/kg						
1% sludge	256	39	73	68	5.4	10.7	1.37
5% sludge	221	38	67	97	4.0	4.9	1.37
10% sludge	320	38	64	68	4.8	5.3	1.37
20% sludge	233	51	78	98	2.8	4.1	1.37
Control	349	57	64	59	5.6	3.9	1.37
Optimum	172	33	56	159	2.4	7.4	1.37
lsd (0.05)	ns	18	ns	ns	ns	ns	ns

Treatment †	Pb	Cd	Hg	Se	Cr
	mg/kg				
1% sludge	<8.66	<0.54	<2	<16.27	0.8
5% sludge	<8.66	<0.54	<2	<16.27	0.8
10% sludge	<8.66	<0.54	<2	<16.27	1.1
20% sludge	<8.66	<0.54	<2	<16.27	1.3
Control	<8.66	<0.54	<2	<16.27	1.2
Optimum	9.9	0.76	<2	<16.27	1.6
lsd (0.05)	ns	ns	ns	ns	ns

†Control, no fertilizers added; Optimum, pots showing highest average biomass production (150 ppm N, 50 ppm P, 50 ppm K).

Soil Physical Properties

Purpose: Soil was amended with 10% sludge to determine if this waste could improve soil physical properties.

Experimental: A sandy loam soil was amended with 10% sludge (dry wt basis) and packed into a 1"x12" polypropylene column. The bottom of this column was fitted with a fritted glass filter and connected to a vacuum source. Soil bulk densities and water infiltration rates in three replicate columns of sludge-amended and unamended soils were determined under air-dried and field moist (0.3 bars tension) conditions. Columns were incubated 28 d and the bulk densities and infiltration rates determined at field capacity (0.3 bars tension) and at saturation (0 bars tension).

Results:

- Amending soil with 10% sludge led to a small reduction in bulk density of 4.1-4.4% after incubation for 28 d (Table 7). This ability to reduce bulk density may be used to advantage in many Louisiana soils where high bulk densities prevent adequate root aeration and development.
- Water infiltration rates were also markedly improved by amending soil with sludge. After 28 d incubation, water infiltration rates in sludge amended soils were 138-156% greater than those of unamended soil.

Table 7. Effects of amending a sandy loam soil with 10% sludge on soil bulk density and water holding capacity.

Sludge applied	Initial		After 28 days	
	Dry	Field cap.	Field cap.	Saturated
		Bulk Density (g/cc)		
None	1.66	1.66	1.68	1.68
10%	1.59	1.62	1.60	1.60
		Infiltration rate (cm/min)		
None	2.45		0.98	0.09
10%	2.60		2.33	0.23

Microbial Activity

Purpose: To determine whether amending soil with sludge inhibited or stimulated overall microbial activity.

Experimental: Samples (100 g dry wt) of sandy loam and clay loam soils were placed in 500 ml wide-mouth jars and amended with 10 ml sludge or and equivalent amount of water. Moisture contents were adjusted to 75% of saturation. A beaker containing 25 ml of 0.05 N NaOH was placed inside the jar to entrap CO_2 evolved as the result of microbial respiration. After incubation for 14 d, the NaOH was back titrated using dilute HCl to determine the CO_2 evolved as a measure of overall microbial activity.

Results:

- Amending soils with 10% sludge increased microbial respiration 48% in a clay loam and 116% in a sandy loam during a 14 day incubation. These responses indicate that sludge does not adversely influence the overall microbial community and provides a ready source of carbon and other nutrients to soil microorganisms.

Effects of Aerosol on Tomato Plants

Purpose: This simple study was performed to determine if over spray or aerosol drift during sludge application could adversely affect growing plants.

Experimental: One hundred ml of sludge was mixed with 900 ml H_2O and subsequently filtered to remove particulates. The filtrate was placed in a hand sprayer and applied heavily to tomato plants at first flower. Tomato plants were used because of their sensitivity to foliar applications.

Results:

- No adverse effects of spraying tomato plants with sludge extract were observed.

Effects of Burial on Odors

Purpose: This study was performed to determine the ability of soils to contain the pungent odor associated with this material.

Experimental: One inch of sandy loam or clay loam soil was placed in a polypropylene column capped on one end. One inch of sludge that had been allowed to ferment was applied to the columns and the sludge covered with 2, 4, 6 and 8" of soil. Additionally, sludge was mixed with various amounts of these soils to simulate application by broadcast and incorporation. After incubation for 1 h, 48 h and 168 h, a person with an average sense of smell who was unaware of the various treatments was asked to compare the odor within the headspace of the columns to that of unburied sludge. A rank of 0 to 5 was assigned where 0 represented no detectable sludge odor and 5 represented the odor of unburied sludge.

Results:

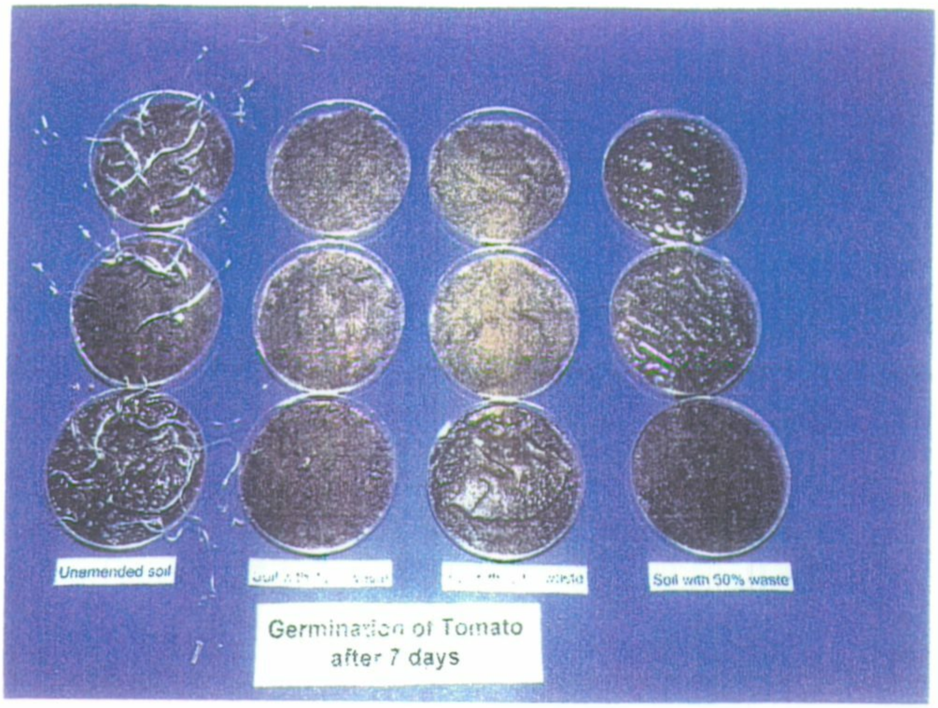
- Burial with 2" of dry clay loam or 4-6" of dry sandy loam soil completely contained the odor associated with application of 1" of this sludge within 1 h after application. No odors were evident in any treatments after 48 h. Greater coverage may be required when sludge is applied to wet soils. Apparently the compounds responsible for this offensive odor are readily oxidized by soil microorganisms or sorbed by soil constituents.
- Mixing sludge with 5 parts clay loam or 15 parts sandy loam also completely contained odors. These findings suggest that in a field application were sludge is thoroughly mixed into the surface 6" of soil immediately after application, no residual odor could be detected when as much as 1.2" of sludge are applied to a clay loam or 0.4" are applied to a sandy loam soil.

Table 8. Odor detected after covering or mixing RSL sludge with various amounts of sandy loam and silt loam soils .

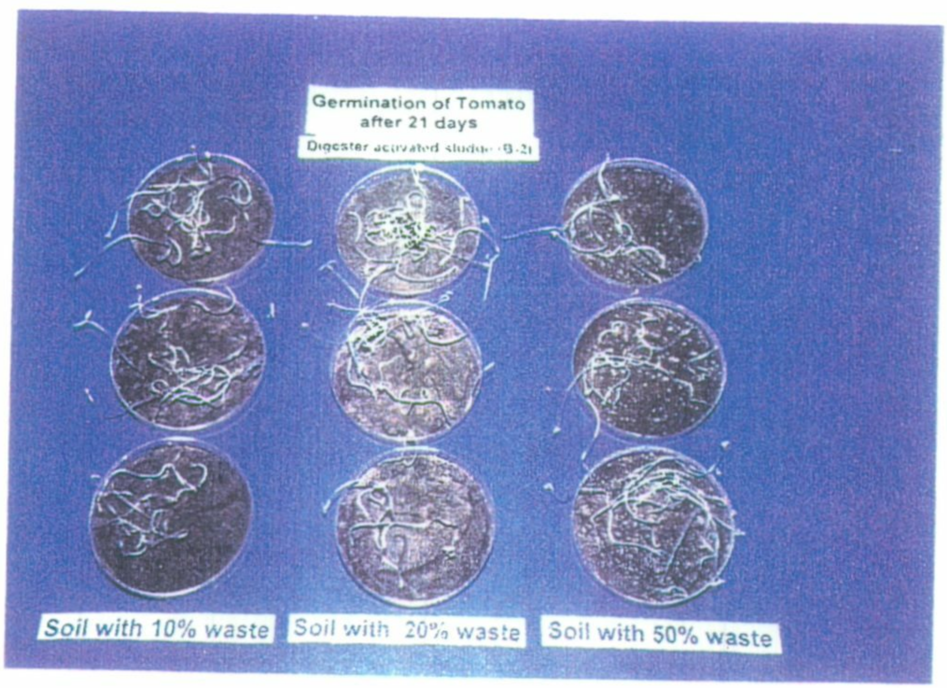
	1 h		48 h		168 h	
Treatment	Sand	Clay	Sand	Clay	Sand	Clay
Depth covered	--------- 0 = no odor ; 5 = odor of unburied sludge ---------					
2"	2	1	0	0	0	0
4"	1	0	0	0	0	0
6"	0	0	0	0	0	0
8"	0	0	0	0	0	0
Sludge:soil (vol:wt)						
1:1	5	3	0	0	0	0
1:3	3	1	0	0	0	0
1:5	2	0	0	0	0	0
1:8	2	0	0	0	0	0
1:10	1	0	0	0	0	0
1:13	1	0	0	0	0	0
1:15	0	0	0	0	0	0

APPENDIX

Photographs



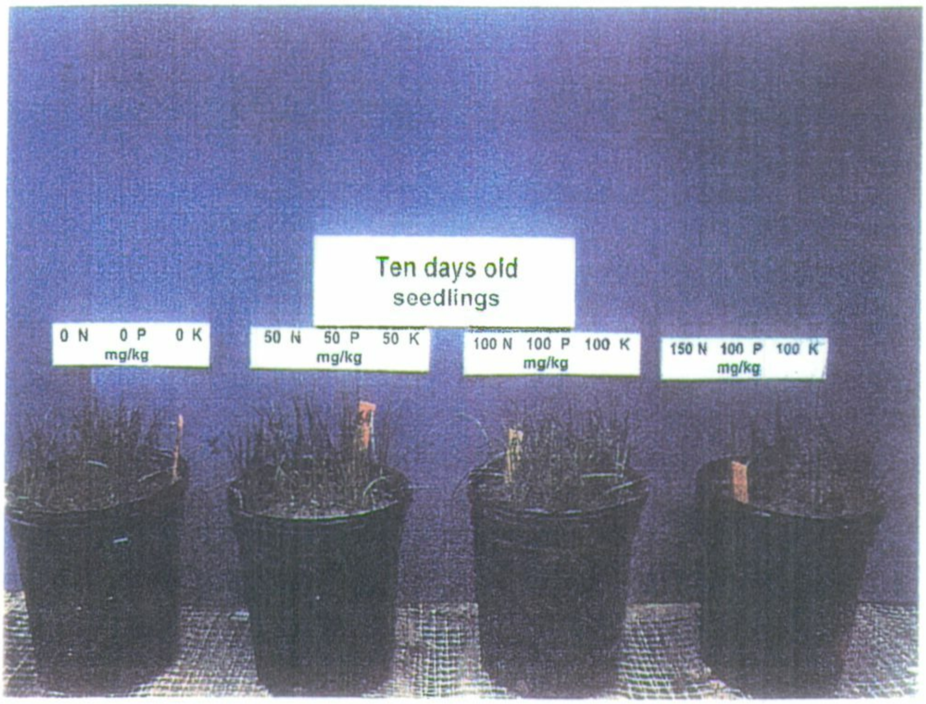
Effects of amending soil with various amounts of sludge
on germination of tomato seedlings
7 days after planting



Effects of amending soil with various amounts of sludge
on germination of tomato seedlings
21 days after planting

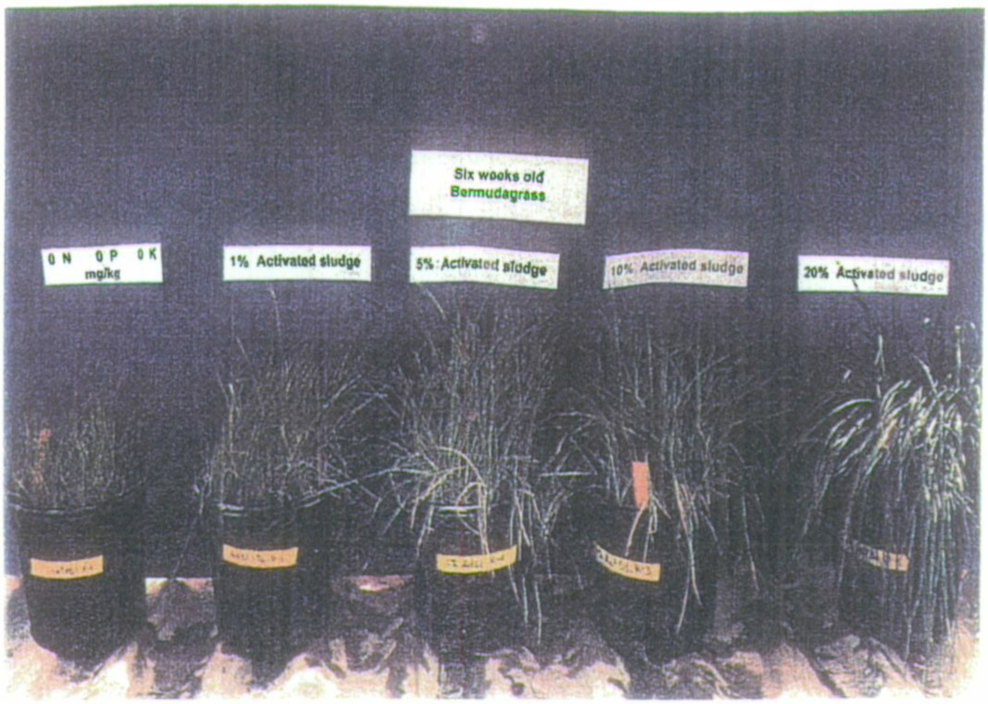
Tomato plants displayed no ill effects when sprayed with sludge extract, indicating that aerial drift or overspray during sludge application poses little threat to nearby plants.

A factorial fertilizer response trial using bermudagrass was conducted in the greenhouse to compare the ability of sludge to supply plant nutrients to that of inorganic fertilizers.

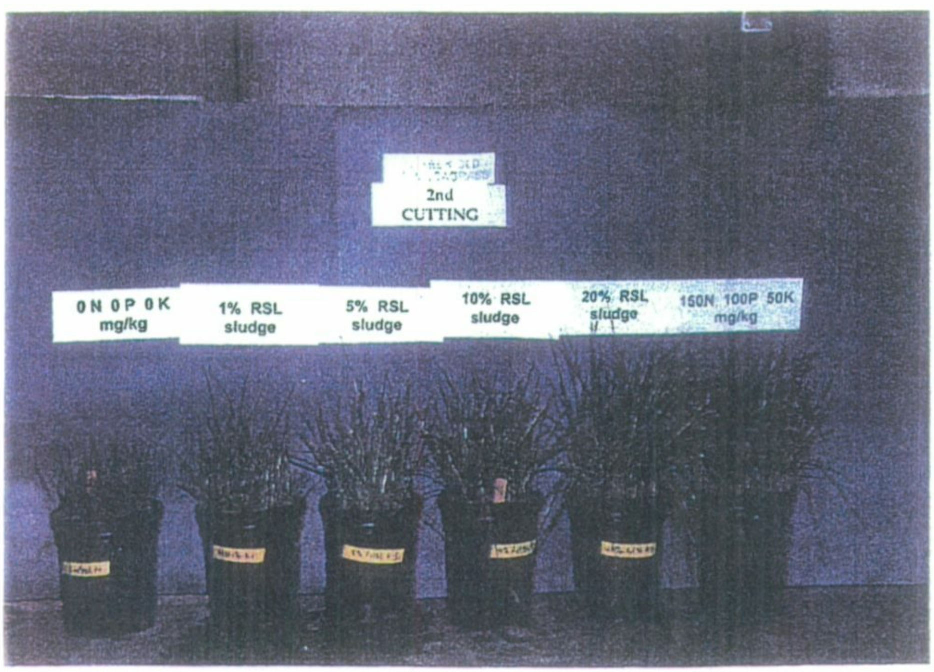


Effects of inorganic fertilizers on establishment of bermudagrass seedlings (10 days after planting)

Seedlings in sludge amended soils were not as vigorous 10 days after planting as those receiving inorganic fertilizers, but good stands were obtained. Sludge was added 14 days prior to planting.



Beneficial responses of bermudagrass to sludge were readily apparent after 6 weeks. Photo taken immediately prior to first cutting.



The ability of sludge to provide nutrients to bermudagrass increased as the experiment was continued. Comparisons between the 20% sludge treatment and the optimum fertilizer treatment indicated the need for a higher sludge rate to obtain optimum yields. N was the limiting nutrient.

Field Trials to Assess of the Agricultural Benefits of Amending Bahiagrass Pasture with Organic By-Products Generated by Remediation Services Of Louisiana, Inc.

Report prepared by:

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Baton Rouge LA 70803-2110

Sept 25, 1995

Preliminary Findings of Field Experiments to Assess the Benefits of Applying Slurried Organic By-Products to Bahiagrass Pasture

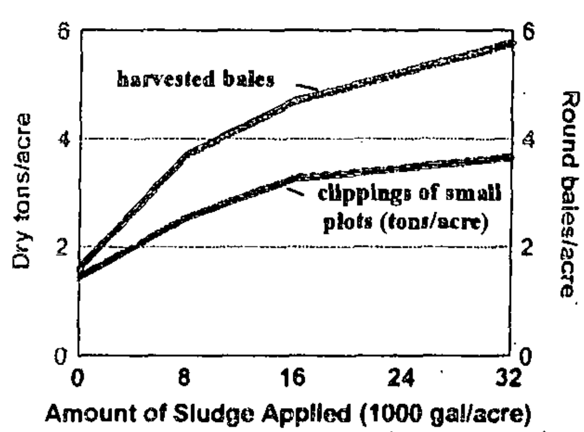
Summary

Injection of RSL's slurried organic by-products into bahiagrass pasture significantly increased yields. It also greatly increased the protein content of harvested hay and otherwise improved forage quality. Forage concentrations of regulated heavy metals were not significantly increased by amending soils with this organic material. No toxicities or other adverse effects of using this by-product as a source of crop nutrients and as a soil conditioner were evident. Despite the fact that the field used for these experiments was undulating and contained slopes exceeding 4%, there was little evidence of nutrient runoff or subsurface flow. Use of a Terragator to inject waste into the surface soil appeared to overcome the odor problems associated with applying this material. Overall, these experiments indicate that RSL's by-product has legitimate potential for safe, beneficial use in forage production. It is very likely that this material would be equally effective as a soil amendment for row crops, especially when applied in combination with reduced rates of inorganic fertilizers.

Experimental

A field experiment to assess the benefits of applying organic by-product to a bahiagrass pasture was performed on Beechgrove Plantation owned and operated by John Barton. The by-product used in these studies was generated as a by-product during the recycling of grease trap wastes by Remediation Services of America (RSL). This material was injected using a two-knife Terragator© at three rates (8000, 16000, and 32000 gallons/acre) into 32 randomly arranged plots (2.3 acres each) of bahiagrass sod. These rates were selected on the basis of previous greenhouse and laboratory evaluations of RSL's by-products. A report of those experiments is available from RSL. The data reported here includes the yields and nutrient uptake in first cuttings of bahiagrass from the experimental field plots obtained August, 1995. Additional cuttings will be obtained to monitor the long term response of bahiagrass to by-product application.

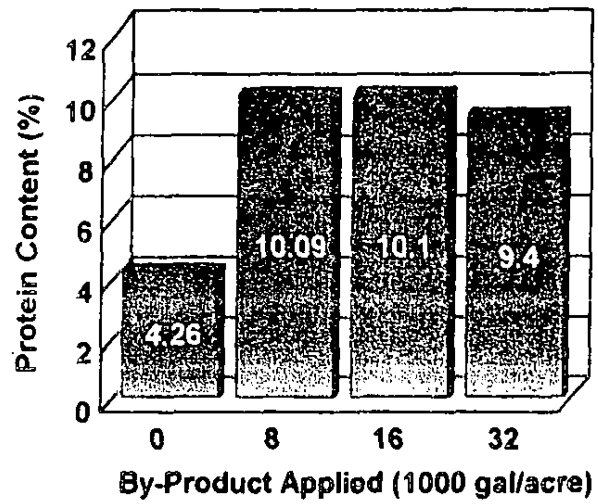
Yield Response (1st cutting) of Bahia Grass to Application of RSL's By-Product



Yield Response

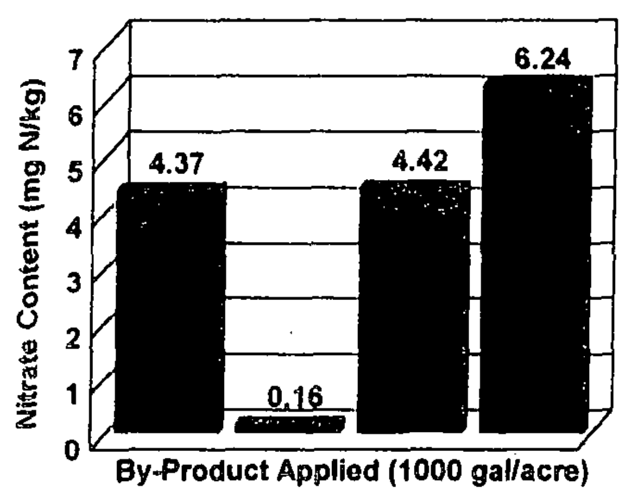
By-product application substantially increased yields of bahiagrass. Measures of yield were obtain by clipping meter-square plots from representative areas from each of the plots and by cutting and baling hay. The latter approach most likely provided the more accurate estimates of yield because of variations in growth response within the large (2.3 acre) plots. Hay harvested during the first cutting of plots receiving 8,000, 16,000 and 32,000 gallons/acre of slurried wasted averaged 3.7, 4,7 and 5.8 bales/acres, respectively. The corresponding yield from unamended control plots averaged 1.6 bales/acre. The greatest increase in yield per 1000 gallons of material applied was obtained at the lowest rate of application (8000 gallon/acre). At this application rate, yields were increased by more than 2 bales/acre. Applying four times that amount of material (32,000 gallons/acre) resulted in yields approximately 4.2 bales greater than those of control plots. It should be noted that these yields are based solely on first cuttings. Residual effects of by-product application are anticipated in additional cuttings this season and in subsequent seasons.

Protein Content of Hay Harvested from Plots Receiving Various Amounts of RSL's By-Produ

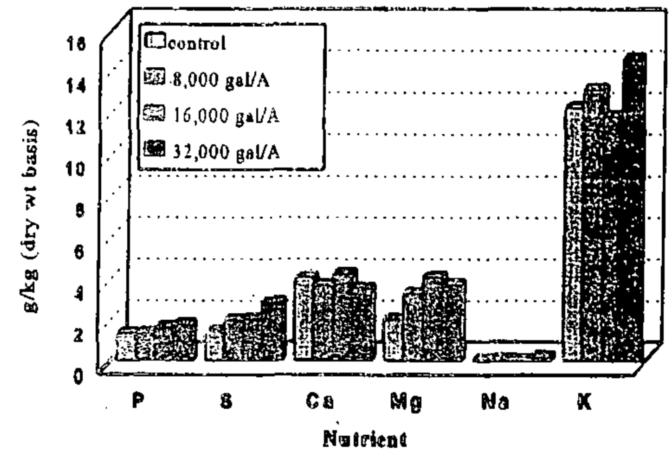


In addition to increasing yields, by-product application significantly improved forage quality. Protein contents of bahiagrass harvested from by-product-amended soils averaged 9.9%, whereas protein of samples harvested from unamended control plots averaged 4.26%. Increasing application rate did not increase protein content, but did lead to higher accumulations of NH_4^+ in aboveground tissue (Table 1). This slight accumulation of NH_4^+ poses no hazard to livestock. Cattle forages are sometimes supplemented with NH_4^+ fertilizers to enhance their digestibility. High nitrate concentrations, however, can pose a hazard to grazing animals. It is noteworthy that despite significant increases in total N content of hay, application of this material did not significantly increase tissue nitrate concentrations. In fact, nitrate concentrations were significantly reduced by application of 8000 gal material/acre.

Nitrate Content of Hay Harvested from Plots Receivi Various Amounts of RSL's By-Product

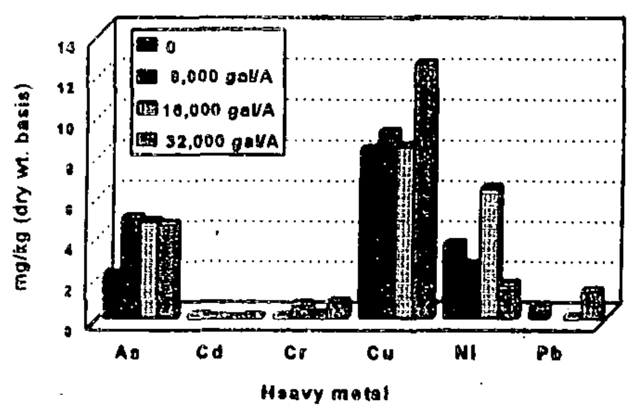


Phosphorous and sulfur uptake tended to increase as the rate of by-product application increased. Increases in phosphorous concentrations were not statistically significant at the 95% level of probability, but were consistently greater than those of hay harvested from control plots. Because of the substantially greater amounts of biomass harvested from amended plots, it is likely that a significant amount of the P taken up by bahiagrass was derived from the applied material. It is also possible that by-product application enhanced the availability of native P in this acidic soil. In either case, the low levels of P in plant tissue (1.3 to 1.8 g/kg) suggest that a deficiency of this nutrient may have limited crop growth. Critical tissue concentrations of P have not been established for bahiagrass, but established values for other southern pasture grasses indicate tissue concentrations below 1.8-2.5 g P/kg reflect P deficiency. Supplementing RSL's by-product with a source of readily available P may greatly enhance the ability of this material to promote growth when this by-product is applied to acidic soils containing low amounts of native P.



The material contained appreciable amounts of sulfur, and the increased uptake in response to RSL's by-product indicate that this material provided an adequate supply of plant-available sulfur. The marked response evident even at the lowest application rate suggests that either growth of bahiagrass in unamended plots was limited by sulfur deficiency, or that SO_4^{2-} was taken up in excess as a result of low PO_4^{3-} availability.

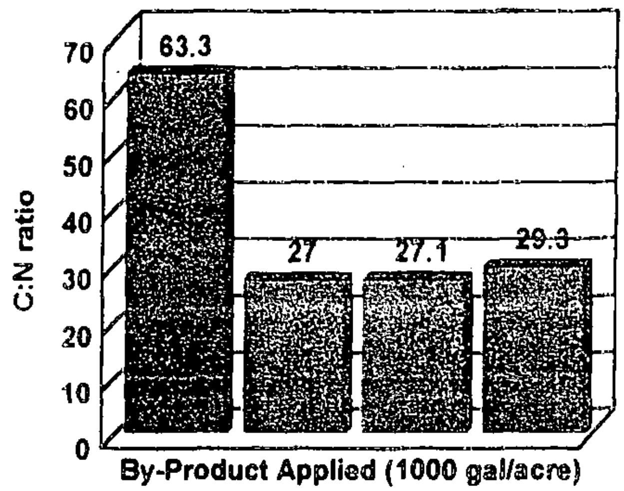
Magnesium but not calcium contents were substantially increased by by-product application, suggesting that this soil may have contained a high Ca:Mg ratio prior to treatment. Uptake of sodium (Na) and iron were also increased slightly but it is unlikely that the small changes in tissue concentration in response to by-product application influenced crop performance.



By-product application did not significantly increase plant uptake of potentially toxic metals (cadmium, copper, nickel, lead, cobalt or arsenate) with the exception of a slight increase in copper concentrations (~4 ppm) at the highest level of application. Arsenic concentrations were slightly elevated by by-product application, but were generally low l (~2 mg/kg of dry tissue) and are not likely to pose a significant health concern.

Arsenic concentrations in the material used in these studies were approximately 11 mg/kg of dry solids.

C:N ratio of Hay Harvested from Plots Receiving Various Amounts of By-Produc



The fiber composition of hay samples was not determined, but the substantially lower C:N ratios of plant tissue and visual inspections of the forage strongly suggest that the digestibility and nutritional value of bahiagrass hay harvested from amended plots was superior to that from control plots.

No adverse environmental impacts were evident. At the lowest level of by-product application (8000 gal/A), growth of bahiagrass was clearly associated with the location of the injection bands. This observation strongly suggests that little surface or subsurface movement of nutrients occurs following by-product application. Luxurious growth of bahiagrass in a small ravine adjacent to the experimental area suggested the possibility nutrient runoff, but apparently this had occurred as the result of an equipment failure that caused slurried by-product to be discharged into the ravine. Such events are likely to occur during a field-scale pilot test where prototype application equipment is being developed.

Conclusions

In general, these studies indicate the application of RSL's by-product can be beneficially used to significantly improve both the quantity and quality of forage grass. The highest rate used in this study (32,000 gal/Ac) did not cause excessive nutrient loading in plant tissue or nutrient loss to nearby areas. The low concentrations of nitrate and metals in plant tissue grown in by-product amended plots indicate that forage may be safely fed to cattle as either as cut hay or as grazed pasture. It is probable that crop response to by-product application will continue for more than one season, especially in plots receiving the higher rates of application. There is no evidence to suggest that the rates of by-product applied in this study will lead to future production or environmental problems. To derive the maximum benefit from this material, it should be applied to soils containing adequate levels of native soil P or should be supplemented with P fertilizer.

SUMMARY

Greenhouse and laboratory studies were performed to assess the agricultural benefits of using sludge generated by hRemediation Services of Louisiana, Inc. (RSL) as a soil amendment. This sludge is generated during the reclamation of grease trap wastes. Preliminary studies were also conducted to determine the suitability of two additional waste streams as soil amendments: the contents of RSL's "day tank" and "cooking tub". The data collected indicate that these wastes may be used beneficially in agriculture as a source of plant nutrients and as a soil conditioner.

Incorporation of as much as 1.2" of the slurried sludge into 6" of soil (~160 cubic yards/Ac) caused no phytotoxicities and markedly improved growth of bermudagrass. Addition of 5% sludge (vol/wt.) fully met crop demands for P, K and S but did not provide sufficient N for optimum biomass production. Greenhouse studies suggest that more than 2.5" of sludge may be applied before exceeding the capacity of bermudagrass to assimilate the added N. Amending soil with sludge did not influence the uptake of micronutrients or heavy metals.

In addition to providing crops with nutrients, addition of sludge improved the physical condition of soil. Bulk densities were reduced and water infiltration rates were substantially increased. Sludge stimulated the overall activity of soil microorganisms.

Because this sludge contains substantial quantities of readily decomposable organic matter, addition of large amounts to soil results in temporary immobilization of plant nutrients. Immobilization may have caused the observed delay in seedling germination in sludge amended soil. In practice, this limitation can be easily overcome by allowing a delay of one to two weeks before planting into sludge amended soils.

Our principal management concern relates to the unwholesome odor the sludge slurry rapidly develops after its removal from the aerobic digester. The specific causes of this odor were not identified, but the unusually high amounts of sulfur in this sludge suggest that volatile organic S compounds are responsible. Laboratory experiments indicated that covering the sludge with 2" of clay soil or 3-4" of silt loam completely contained odors. Also, mixing the sludge in ratios of 1 part sludge to 5 parts dry clay loam or 15 parts sandy loam soil contained odors. These findings suggest that odor problems can be avoided by application techniques that bury this sludge in shallow furrows or rapidly mix it into the surface soil by harrowing, etc.

"Cook tub" and "day tank" wastes were not fully evaluated as soil amendments, but chemical analyses suggest that they may also be effective as soil conditioners and as a source of plant nutrients. A longer delay between application and planting (2-4 weeks) is advisable to ensure that these materials to not inhibit crop development due to temporary immobilization of crop nutrients.

On the basis of these greenhouse and laboratory studies, it is our general conclusion that the application of the slurried sludge generated by RSL to agricultural soils constitutes a legitimate beneficial use and poses no significant environmental hazard. Application rates of as much as 300

cubic yards/Ac/yr to bermudagrass are not likely to result in excessive accumulations of nitrate provided that hay is harvested and nutrients continuously removed from fields. Caution should be exercised to ensure that high application rates do not exceed the capacity of soils to retain this slurried material and do not result in runoff into nearby waterways. Application techniques that contain odors will be necessary where odors pose a nuisance to residents.

CHEMICAL ANALYSES

Purpose: Three wastes generated during the reclamation of grease trap wastes were analyzed to determine the amounts of plant nutrients and potentially harmful metals contained in these materials.

Experimental: Representatives samples of three wastes (sludge, "day tank", and "cook tub") were provided by RSL. These materials were stored at 4°C until use in these experiments. Subsamples were separated into solids and liquids by centrifugation and these fractions analyzed independently. Ash content was determined by loss on ignition of material at 550°C. Organic C and total N were determined by a dry combustion technique using a automated CHN analyzer. Extractable NH_4 and NO_3 were determined using an automated ion diffusion technique. Other elements were determined by ion-coupled plasma spectrophotometry of nitric-perchloric acid digests of solid and liquid fractions. Triplicate analyses were performed using replicate samples of each waste.

Results:

Sludge

- The sludge contained about 15.1% solids comprised of 43.5% C, 4.5% N, 0.7% P, and 0.8% K. The concentrations of other elements and the lbs of various components contained in a cubic yard of sludge slurry are shown in Table 1. These solids also contained an unusually high amount of S (800 mg/kg), presumably derived from amino acids and other organic S compounds.

- A cubic yard of sludge slurry was estimated to contain 0.46 lbs N as NH_4^+ or NO_3^- and an additional 10.5 lbs as organic N. The presence of NH_4^+ or NO_3^- may be due to the fact that containment of the sludge in sealed containers limited microbial activity. Temporary immobilization of these N forms is likely to occur once the material is applied to soils (see mineralization studies).

- With the exceptions of Fe and Zn, metal concentrations did not exceed those typical of Louisiana soils.

- Both the solid and liquid fractions contained high concentrations of soluble salts. The molar ratio of Ca to Na was very low (0.7:1). A Ca:Na molar ratio of at least 5:1 is generally desirable.

Day Tank and Cook Tub

- Day tank and cook tub slurries contained more organic solids than did activated sludge. Higher C:N ratios (15.9:1) suggest that microorganisms have not exhausted the energy available in organic components and therefore a greater potential exists for immobilization of plant nutrients.

- Salts and pH were lower than in sludge.

Table 1. Composition of three organic materials in the waste stream generated during grease trap recycling.

Property	Sludge Solids	Sludge Liquids	Slurry lbs/cu. yd	Day Tank Solids	Day Tank Liquids	Slurry lbs/cu. yd	Cook Tub Solids	Cook Tub Liquids	Slurry lbs/cu. yd
% of total (wt/wt)	15.1%	84.9%		27.1%	72.9%		23.3%	76.7%	
% ash	27.5%	nd		27.6%	nd		13.8%	nd	
pH	5.91	5.84		4.91	4.94		4.82	4.85	
Organic C (%)	43.1%	0.2%	104.8	43.7%	0.7%	185.3	60.5%	0.7%	230.6
Total N (%)	4.5%	0.02%	10.9	2.7%	0.0%	11.7	3.3%	0.0%	12.5
C:N ratio	9.6	9.6		15.9	15.9		18.5	18.5	
NH4-N (mg/kg)	1205	119	0.44	821	226	0.58	271	141	0.27
NO3-N (mg/kg)	56	6	0.02	0	8	0.01	7	4	0.01
P (mg/kg)	700	28	0.20	1097	17	0.47	271	28	0.13
K (mg/kg)	792	99	0.32	286	117	0.24	119	32	0.08
S (mg/kg)	801	200	0.45	138	34	0.09	694	27	0.29
Ca (mg/kg)	6178	545	2.18	415	1109	1.38	672	283	0.59
Mg (mg/kg)	314	31	0.11	108	59	0.11	43	11	0.03
Na (mg/kg)	5086	742	2.18	504.5	256.0	0.49	670.0	196.8	0.48
As (mg/kg)	11.7	0.0	0.00	10.9	0.1	0.00	5.5	0.1	0.00
Cd (mg/kg)	0.1	0.0	0.00	1.8	0.0	0.00	0.7	0.0	0.00
Cu (mg/kg)	2.7	0.0	0.00	24.0	0.0	0.01	42.2	0.0	0.02
Fe (mg/kg)	536.3	64.9	0.21	137.1	288.1	0.37	196.4	48.1	0.13
Mn (mg/kg)	46.4	2.5	0.01	11.9	3.3	0.01	8.7	1.4	0.00
Ni (mg/kg)	5.3	0.0	0.00	3.7	0.0	0.00	3.6	0.0	0.00
Pb (mg/kg)	2.8	0.0	0.00	18.0	0.0	0.01	10.8	0.0	0.00
Zn (mg/kg)	91.6	0.1	0.02	116.5	0.1	0.05	153.2	0.9	0.06
Salts (mg/kg)	22312	4013	10.6	4863.5	3894	6.2	4896.5	1815	4.0
Conduct. (µmhos)	7225	6080		1475	5900		1485	2750	

Nitrogen Mineralization

Purpose: N mineralization was monitored to determine the extent and duration of nutrient immobilization following the addition of wastes to soils.

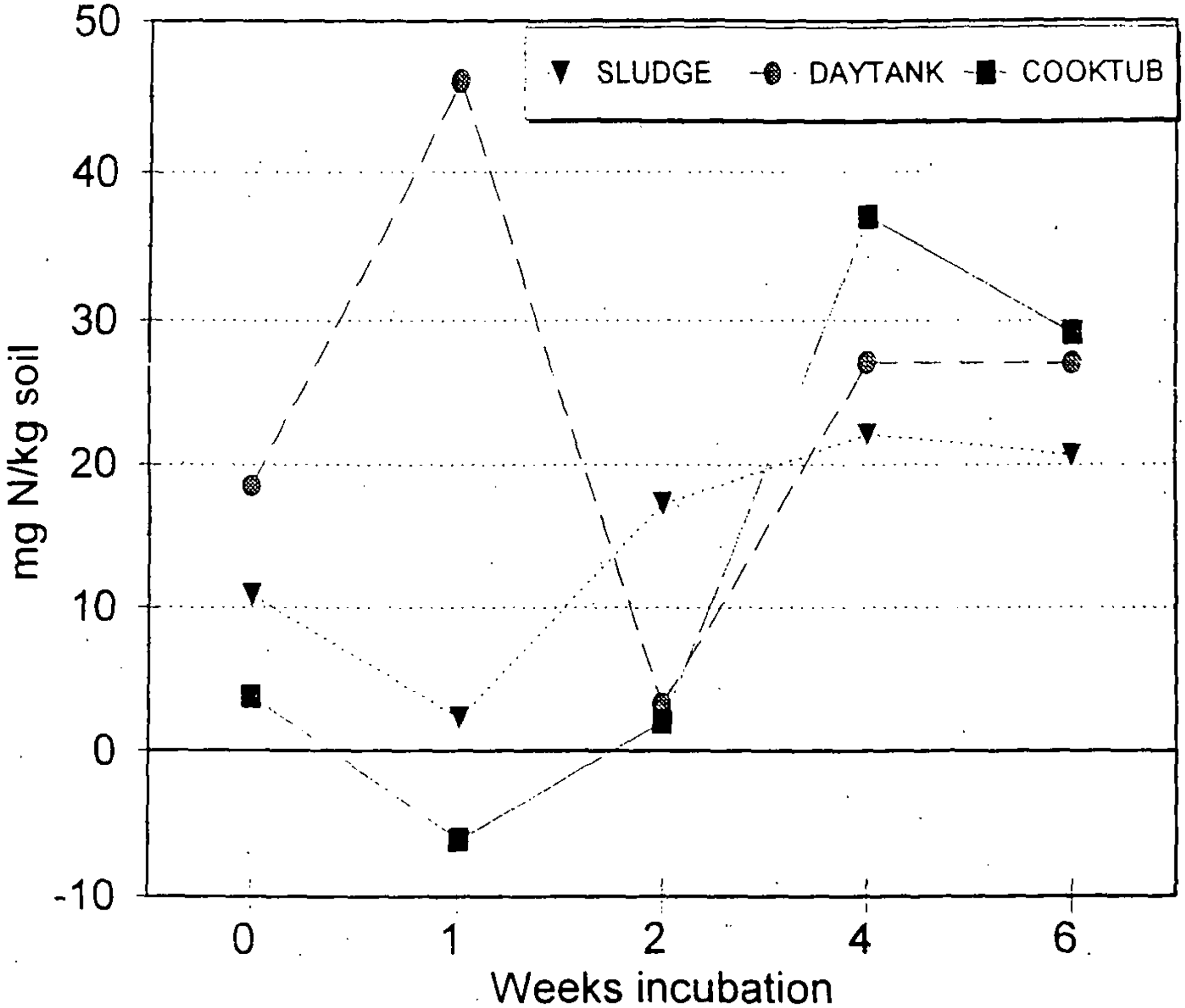
Experimental: Samples of sandy loam soil (100g) were amended with 10 ml of sludge, day tank and cook tub slurries and placed in 70-mm diameter Buchner funnels fitted containing #52 Whatman filter papers. Soils were leached with 100 ml aliquots of CaCl (0.01 M) after 0, 7, 14, 28 and 42 days of incubation (25°C; 0.2 bars tension). The amounts of NH_4^+ and NO_3^- in leachates were determined using a automated ion diffusion technique. Net mineralization was calculated as the difference between the amounts of extractable inorganic N in leachates obtained from sludge amended and from unamended soil samples. Experiments were performed in duplicate.

Results:

- Fig. 1 shows the net N mineralization due to amending soil with 10% (vol/wt) slurries obtained from aerobic digestor (sludge), day tank and cooking tub.
- Sludge and cook tub wastes behaved similarly although the slurry obtained from the cooking tub required longer incubation before net N mineralization was evident. Day tank wastes displayed an initial rapid mineralization followed a period of immobilization.
- These findings suggest that when soil conditions support vigorous microbial activity, a period of two weeks is required before significant mineralization of sludge occurs. A delay of 3-4 weeks is advisable after addition of day tank or cooking tub wastes to avoid immobilization of plant nutrients. Longer periods will be required when microbial activity is limited by low soil temperatures, high moisture contents or other adverse environmental conditions.

Fig. 1. Net N mineralization

Soil amended with 10% wastes (vol/wt)



Seed Germination

Purpose: The effects of various amounts of sludge on seed germination were studied to identify possible toxicities or inhibitions.

Experimental: Samples of sandy loam soil (25 g) were amended with 0, 2.5, 5.0 or 12.5 ml of sludge and placed in 5.5 cm petri dishes. Moisture contents were adjusted to near saturation. Twenty tomato seeds were pressed into the soil surface of dish and the dishes incubated in the dark at 25°C . Tomato seeds were used because of their sensitivity to those soil conditions adverse to plant development. The number of emergent seedlings were counted after 7, 14 and 21 days.

Results:

- Table 2 shows that amending soils with sludge delayed seedling germination for at least 7 days. The percentages of seedlings emerged after 21 d in sludge amended soils were significantly less than in unamended controls. The adverse effects of this sludge were more apparent in soil amended with 50% sludge than in soil amended with lower amounts.
- The inhibitory effects of this sludge on tomato seed germination may have been caused by immobilization of N and other plant nutrients. In a subsequent greenhouse study where sludge was incorporated into soil 14 days prior to planting bermudagrass seed, no adverse effects on seed germination were evident.

Table 2. Tomato seed germination in a sandy loam soil amended with sludge .

Sludge added (vol/wt)	% seed germination		
	7 days	14 days	21 days
0%	90%	90%	90%
10%	0%	64%	68%
20%	0%	53%	67%
50%	0%	33%	58%

Greenhouse Trials

Purpose: The fertilizer value of sludge was determined in a greenhouse study where responses of bermudagrass to various application rates of sludge were compared with those obtained by applying various combinations of inorganic fertilizers to establish the fertilizer value of this waste.

Experimental: The capacity of this organic waste to supply nutrients to plants was evaluated in greenhouse trials where the responses of bermudagrass to 1%, 5%, 10%, 20% (vol/wt) of RSL's sludge slurry were compared to responses to four rates of inorganic N (0, 50, 100 and 150 mg N/kg), three rates of P (0, 50 and 100 mg P/kg) and three rates of K (0, 50 and 100 mg K/kg) applied in a factorial design. Sludge was applied on a volume rather than dry weight basis to allow convenient extrapolation to obtain field application rates (Table 3). The specific amounts of selected components added to pots receiving various rates of sludge are shown in Table 4. Treatments were applied to 2.00 kg sandy loam soil in 6-in. dia. pots 14 days prior to seeding bermudagrass. Plants were grown for 10 weeks in a greenhouse equipped with an automated overhead irrigation system adjusted to maintain adequate moisture for optimum growth and to avoid excessive watering that would result in leaching of nutrients from pots. All treatments were established in triplicate.

The above ground biomass was harvested 6 and 10 weeks after planting. Dry weight, N% content and total N uptake was determined for sample from each pot. Total N was determine by an automated dry combustion technique using a CHN analyzer. The elemental composition of the biomass samples of selected treatments were determined by ICP analysis of nitric acid digests.

Results:

- All rates of sludge application to bermudagrass resulted in significantly greater biomass production than obtained from unfertilized controls (Table 5).
- A greater percentage of total growth was obtained from the second cutting of pots receiving sludge than was obtained from pots receiving inorganic sources of nutrients. This suggests that sludge behaves similar to slow-release forms of fertilizer and would be especially valuable in situations where N fertilizers are subject to loss via leaching or denitrification.
- Biomass production in pots receiving 20% sludge (160 cubic yards/Ac) was not as great as in pots receiving the optimum amounts of inorganic fertilizers (150 mg N, 50 mg P and 50 mg K/kg). Apparently, even this high rate of application did not fully satisfy the N demands of bermudagrass. N contents of leaves indicated that application of 20% sludge was equivalent to applying 65 mg NH_4NO_3-N/kg or approximately 200 lbs fertilizer N/Ac. Optimum yields of bermudagrass were obtained by application of more than double that amount of inorganic N fertilizers in this greenhouse study.
- Figure 2 shows the fertilizer N efficiency of sludge applied at various rates. Efficiency was greater were lower amounts of sludge were applied, but even at higher application rates plant uptake of sludge-derived N accounted for more than 4% of total N applied. Plants were growing vigorously at the end of this study and therefore it can be assumed that under

Louisiana's long summer growing season the efficiency would be greater than the values in Fig. 2 indicate. Where excessive N fertilizer is to be avoided, a conservative estimate of 6-8% efficiency of applied N should be used when estimating application rates. For example, applying 100 cubic yards of sludge containing 10.9 lbs total N/cubic yard can be considered equivalent to applying 65 to 87 lbs inorganic fertilizer N.

- Analyses of the elemental composition of the above ground biomass indicated that application of sludge at rates of 5% or more significantly increased plant uptake of P, K, and S (Table 6). Application of sludge at rates of 10% or more fully satisfied plant demand for these nutrients.

- Sludge application did not significantly influence uptake of Ca, Mg, micronutrients or heavy metals. Sodium concentrations in plants receiving sludge were greater than in unfertilized plants, and concentrations tended to increase with increasing rate of sludge application. It is not advisable to apply this sludge to soils were Na accumulation is a problem, such as in the irrigated regions of the Macon Ridge in Louisiana.

- In summary, RSL's sludge appears to be an excellent source of N, P, K and S. N was the most limiting nutrient when this sludge was used for growing bermudagrass, a crop with a high demand for N. No adverse effects of amending soils with as much as 20% sludge were evident in this greenhouse trial. Sludge did not increase heavy metal uptake by bermudagrass.

Table 3. Approximate field application rates extrapolated from greenhouse rates.

Rate (vol/wt)	Inches applied to soil surface	Cubic yards per Acre	Solids	Mineral	Org. C	Total N	Salts
			lbs/Ac				
1% sludge	0.06	8.1	1910	574	849	89	86
5% sludge	0.3	40.3	9503	2857	4223	441	426
10% sludge	0.6	80.7	19053	5722	8466	884	854
20% sludge	1.2	161.4	38058	11444	16312	1765	1705

Table 4. Amounts of various components added to pots amended with 1, 5, 10 or 20% sludge slurry.

	(g/pot added)			
Component	1%	5%	10%	20%
Wet Wt	20.14	100.70	201.40	402.80
Solids	3.05	15.25	30.49	60.98
Liquids	17.00	85.00	170.00	340.00
Org. C	1.35	6.77	13.55	27.10
N	0.14	0.70	1.41	2.82
P	0.00	0.01	0.03	0.05
K	0.00	0.02	0.04	0.08
S	0.01	0.03	0.06	0.12

Table 5. Effects of applying RSL sludge and various amounts of inorganic N and P on biomass, tissue N concentrations and total N uptake by bermudagrass

	1st cutting (6 wks)			2nd cutting (10 wks)			Both cuttings		
Treatment †	Biomass (g)	Total N%	N (g/pot)	Biomass (g	Total N%	N (g/pot)	Biomass (g	Total N%	N (g/pot)
1% sludge	2.17	1.48	0.032	3.37	0.67	0.022	5.54	0.99	0.055
5% sludge	3.04	1.56	0.047	3.18	0.78	0.024	6.23	1.14	0.071
10% sludge	3.25	1.80	0.059	3.52	0.86	0.030	6.76	1.31	0.088
20% sludge	3.67	2.26	0.082	5.54	1.02	0.056	9.20	1.51	0.139
Control	1.00	1.34	0.013	2.63	0.60	0.015	3.63	0.80	0.028
Optimum	10.81	3.28	0.355	6.93	1.10	0.075	17.74	2.50	0.444
	Main effects of application of various levels of inorganic fertilizers								
0 N	0.89	1.39	0.012	1.80	0.77	0.013	2.69	0.96	0.026
50 N	4.37	1.80	0.080	3.59	0.85	0.029	7.97	1.37	0.110
100 N	6.18	2.46	0.154	4.53	1.00	0.045	10.71	1.81	0.199
150 N	6.62	2.63	0.177	5.17	1.07	0.057	11.79	1.93	0.234
0 P	2.49	2.05	0.058	3.40	0.89	0.034	5.88	1.38	0.091
50 P	5.71	2.02	0.134	4.01	0.93	0.038	9.72	1.56	0.172
100 P	5.35	2.13	0.127	3.91	0.94	0.036	9.26	1.61	0.163

†Control, no fertilizers added; Optimum, pots showing highest average biomass production (150 ppm N, 50 ppm P, 50 p

Fig. 2. Efficiency of N uptake

Greenhouse Trials

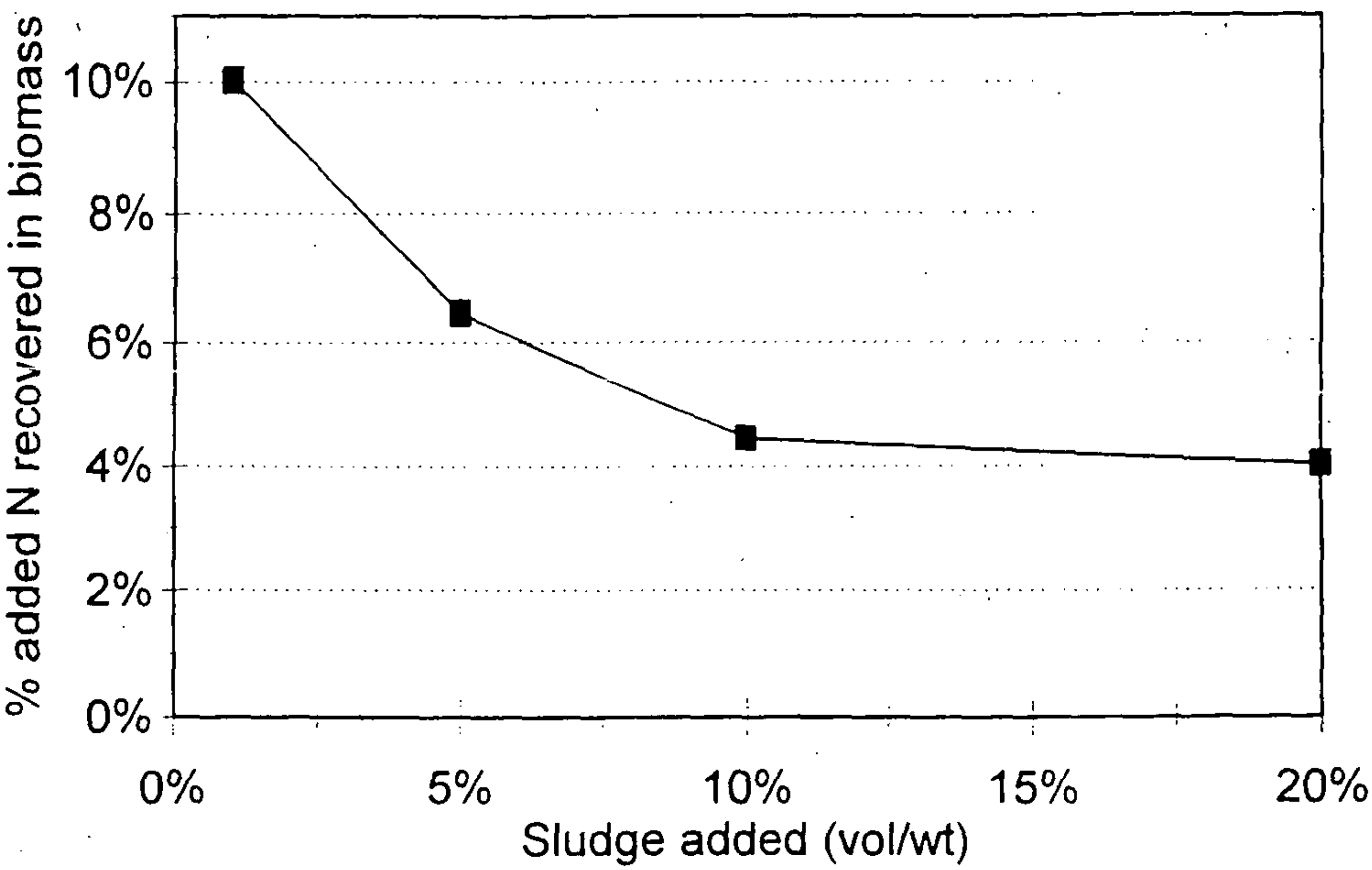


Table 6. Effects of applying RSL sludge and various levels of inorganic N and P on the ele composition of *above ground biomass.*

Treatment †	P	K	S	Ca	Mg	Na	Al
	mg/kg						
1% sludge	2419	27258	2386	6956	3269	6424	178.1
5% sludge	3211	28920	2310	6348	2678	6789	144.7
10% sludge	4275	31241	2969	6242	2796	7555	205.2
20% sludge	4906	32334	3285	6480	2556	8916	110.8
Control	2149	22243	1868	8104	3248	5511	213.2
Optimum	3875	29017	2698	5704	2760	8099	107.9
lsd (0.05)	1255	5549	970	1302	ns	ns	ns

Treatment †	Fe	Mn	Zn	Cu	Co	Ni	B
	mg/kg						
1% sludge	256	39	73	68	5.4	10.7	1.37
5% sludge	221	38	67	97	4.0	4.9	1.37
10% sludge	320	38	64	68	4.8	5.3	1.37
20% sludge	233	51	78	98	2.8	4.1	1.37
Control	349	57	64	59	5.6	3.9	1.37
Optimum	172	33	56	159	2.4	7.4	1.37
lsd (0.05)	ns	18	ns	ns	ns	ns	ns

Treatment †	Pb	Cd	Hg	Se	Cr
	mg/kg				
1% sludge	<8.66	<0.54	<2	<16.27	0.8
5% sludge	<8.66	<0.54	<2	<16.27	0.8
10% sludge	<8.66	<0.54	<2	<16.27	1.1
20% sludge	<8.66	<0.54	<2	<16.27	1.3
Control	<8.66	<0.54	<2	<16.27	1.2
Optimum	9.9	0.76	<2	<16.27	1.6
lsd (0.05)	ns	ns	ns	ns	ns

†Control, no fertilizers added; Optimum, pots showing highest average biomass production (150 ppm N, 50 ppm P, 50 ppm K).

Soil Physical Properties

Purpose: Soil was amended with 10% sludge to determine if this waste could improve soil physical properties.

Experimental: A sandy loam soil was amended with 10% sludge (dry wt basis) and packed into a 1"x12" polypropylene column. The bottom of this column was fitted with a fritted glass filter and connected to a vacuum source. Soil bulk densities and water infiltration rates in three replicate columns of sludge-amended and unamended soils were determined under air-dried and field moist (0.3 bars tension) conditions. Columns were incubated 28 d and the bulk densities and infiltration rates determined at field capacity (0.3 bars tension) and at saturation (0 bars tension).

Results:

- Amending soil with 10% sludge led to a small reduction in bulk density of 4.1-4.4% after incubation for 28 d (Table 7). This ability to reduce bulk density may be used to advantage in many Louisiana soils where high bulk densities prevent adequate root aeration and development.
- Water infiltration rates were also markedly improved by amending soil with sludge. After 28 d incubation, water infiltration rates in sludge amended soils were 138-156% greater than those of unamended soil.

Table 7. Effects of amending a sandy loam soil with 10% sludge on soil bulk density and water holding capacity.

Sludge applied	Initial		After 28 days	
	Dry	Field cap.	Field cap.	Saturated
		Bulk Density (g/cc)		
None	1.66	1.66	1.68	1.68
10%	1.59	1.62	1.60	1.60
		Infiltration rate (cm/min)		
None	2.45		0.98	0.09
10%	2.60		2.33	0.23

Microbial Activity

Purpose: To determine whether amending soil with sludge inhibited or stimulated overall microbial activity.

Experimental: Samples (100 g dry wt) of sandy loam and clay loam soils were placed in 500 ml wide-mouth jars and amended with 10 ml sludge or and equivalent amount of water. Moisture contents were adjusted to 75% of saturation. A beaker containing 25 ml of 0.05 N NaOH was placed inside the jar to entrap CO_2 evolved as the result of microbial respiration. After incubation for 14 d, the NaOH was back titrated using dilute HCl to determine the CO_2 evolved as a measure of overall microbial activity.

Results:

- Amending soils with 10% sludge increased microbial respiration 48% in a clay loam and 116% in a sandy loam during a 14 day incubation. These responses indicate that sludge does not adversely influence the overall microbial community and provides a ready source of carbon and other nutrients to soil microorganisms.

Effects of Aerosol on Tomato Plants

Purpose: This simple study was performed to determine if over spray or aerosol drift during sludge application could adversely affect growing plants.

Experimental: One hundred ml of sludge was mixed with 900 ml H_2O and subsequently filtered to remove particulates. The filtrate was placed in a hand sprayer and applied heavily to tomato plants at first flower. Tomato plants were used because of their sensitivity to foliar applications.

Results:

- No adverse effects of spraying tomato plants with sludge extract were observed.

Effects of Burial on Odors

Purpose: This study was performed to determine the ability of soils to contain the pungent odor associated with this material.

Experimental: One inch of sandy loam or clay loam soil was placed in a polypropylene column capped on one end. One inch of sludge that had been allowed to ferment was applied to the columns and the sludge covered with 2, 4, 6 and 8" of soil. Additionally, sludge was mixed with various amounts of these soils to simulate application by broadcast and incorporation. After incubation for 1 h, 48 h and 168 h, a person with an average sense of smell who was unaware of the various treatments was asked to compare the odor within the headspace of the columns to that of unburied sludge. A rank of 0 to 5 was assigned where 0 represented no detectable sludge odor and 5 represented the odor of unburied sludge.

Results:

- Burial with 2" of dry clay loam or 4-6" of dry sandy loam soil completely contained the odor associated with application of 1" of this sludge within 1 h after application. No odors were evident in any treatments after 48 h. Greater coverage may be required when sludge is applied to wet soils. Apparently the compounds responsible for this offensive odor are readily oxidized by soil microorganisms or sorbed by soil constituents.

- Mixing sludge with 5 parts clay loam or 15 parts sandy loam also completely contained odors. These findings suggest that in a field application were sludge is thoroughly mixed into the surface 6" of soil immediately after application, no residual odor could be detected when as much as 1.2" of sludge are applied to a clay loam or 0.4" are applied to a sandy loam soil.

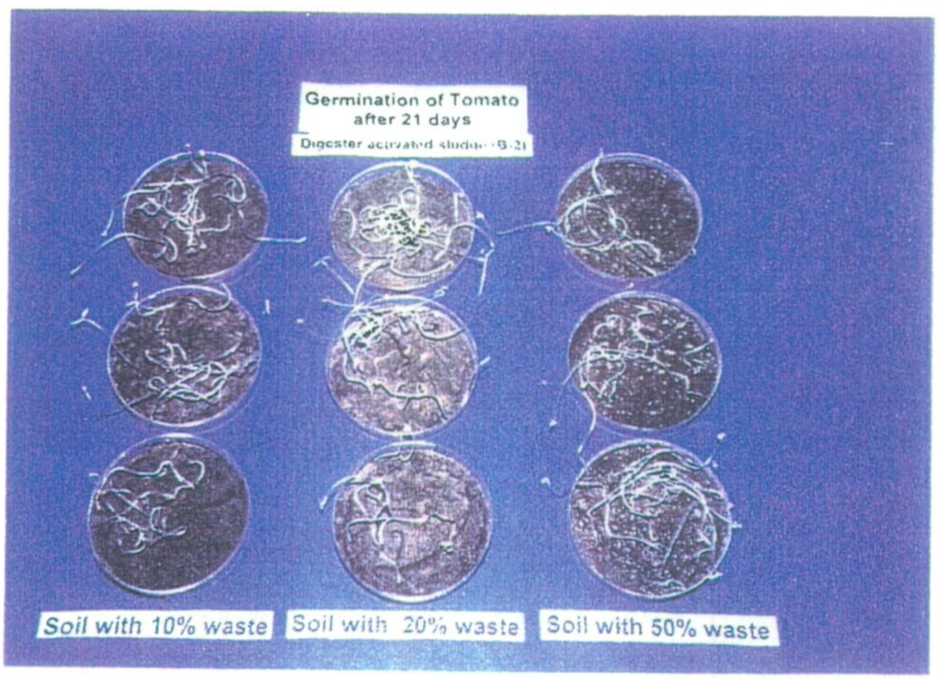
Table 8. Odor detected after covering or mixing RSL sludge with various amounts of sandy loam and silt loam soils .

	1 h		48 h		168 h	
Treatment	Sand	Clay	Sand	Clay	Sand	Clay
Depth covered	--------- 0 = no odor ;		5 = odor of unburied sludge ---------			
2"	2	1	0	0	0	0
4"	1	0	0	0	0	0
6"	0	0	0	0	0	0
8"	0	0	0	0	0	0
Sludge:soil (vol:wt)						
1:1	5	3	0	0	0	0
1:3	3	1	0	0	0	0
1:5	2	0	0	0	0	0
1:8	2	0	0	0	0	0
1:10	1	0	0	0	0	0
1:13	1	0	0	0	0	0
1:15	0	0	0	0	0	0

APPENDIX

Photographs

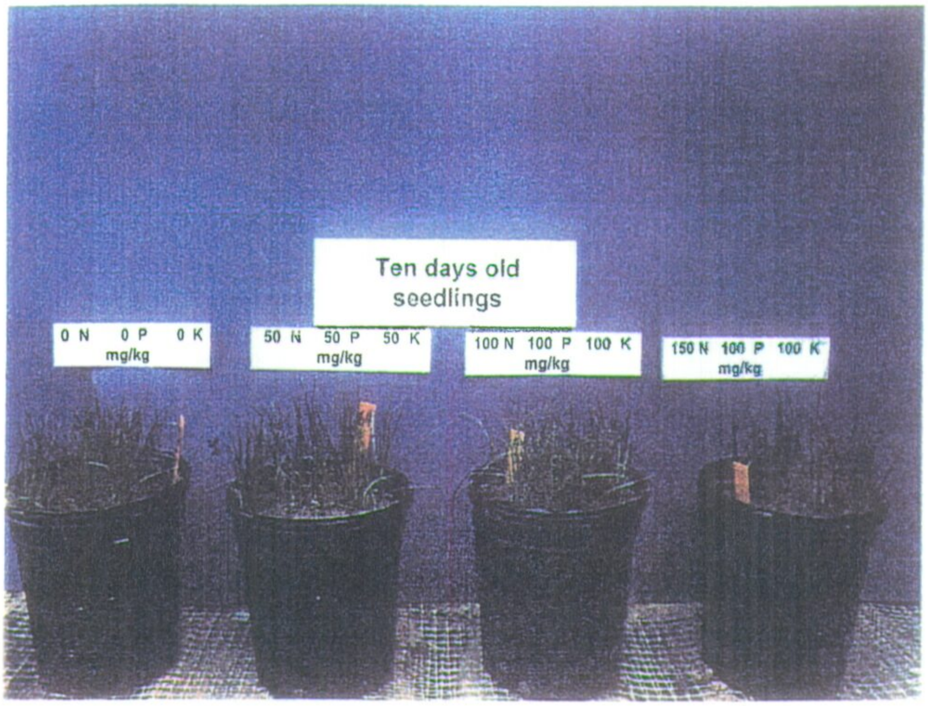
Effects of amending soil with various amounts of sludge
on germination of tomato seedlings
7 days after planting



Effects of amending soil with various amounts of sludge
on germination of tomato seedlings
21 days after planting

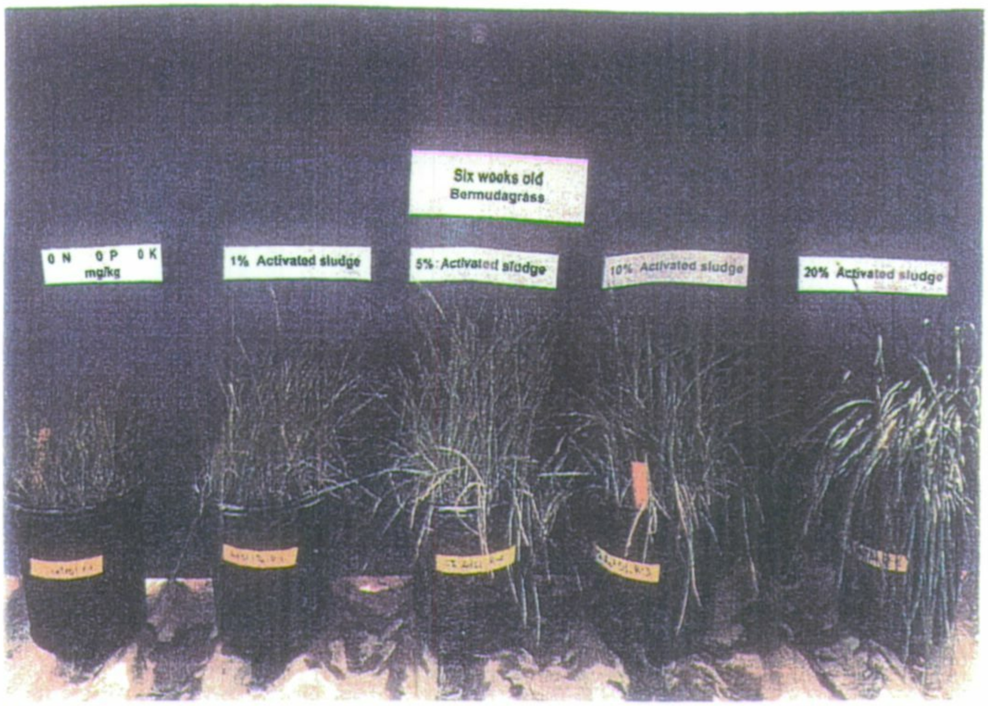
Tomato plants displayed no ill effects when sprayed with sludge extract, indicating that aerial drift or overspray during sludge application poses little threat to nearby plants.

A factorial fertilizer response trial using bermudagrass was conducted in the greenhouse to compare the ability of sludge to supply plant nutrients to that of inorganic fertilizers.



Effects of inorganic fertilizers on establishment of bermudagrass seedlings (10 days after planting)

Seedlings in sludge amended soils were not as vigorous 10 days after planting as those receiving inorganic fertilizers, but good stands were obtained. Sludge was added 14 days prior to planting.



Beneficial responses of bermudagrass to sludge were readily apparent after 6 weeks. Photo taken immediately prior to first cutting.

The ability of sludge to provide nutrients to bermudagrass increased as the experiment was continued. Comparisons between the 20% sludge treatment and the optimum fertilizer treatment indicated the need for a higher sludge rate to obtain optimum yields. N was the limiting nutrient.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1991. Soil names and descriptions were approved in 1992. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1991. This survey was made cooperatively by the Natural Resources Conservation Service, the Louisiana Agricultural Experiment Station, and the Louisiana Soil and Water Conservation Committee. The survey is part of the technical assistance furnished to the Feliciana Soil and Water Conservation District.

Cover: Pasture and corn in an area of Tangi silt loam, 1 to 3 percent slopes.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service home page on the World Wide Web. The address is http://www.nrcs.usda.gov (click on "Technical Resources").

SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, or D, shows the slope. Symbols without a slope letter are for nearly level soils and land types. Soils that are eroded have a final number, 2, in their symbol.

SYMBOL	NAME
CaB	Cahaba sandy loam, 1 to 3 percent slopes
Cc	Calhoun silt loam
Cf	Calhoun–Bonn and Fountain silt loams
Cl	Coscillo silt loam, undulating, overflow
Co	Commerce loam
Cr	Crevasse soils, overflow
De	Deerford silt loam
DfA	Deerford–Olivier silt loams, 0 to 1 percent slopes
DfB	Deerford–Olivier silt loams, 1 to 3 percent slopes
Dn	Deerford–Verdun silt loams
DrA	Dexter very fine sandy loam, 0 to 1 percent slopes
DrB	Dexter very fine sandy loam, 1 to 3 percent slopes
DuA	Dundee–Amagon complex, 0 to 1 percent slopes
DuB	Dundee–Amagon complex, undulating
DyB	Dundee–Tensas–Sharkey complex, undulating
En	Essen silt loam
Es	Essen and Lafe silt loams
Fn	Fountain silt loam
Fo	Fountain and Bonn silt loams
Fr	Fred silt loam
Fs	Fred–Deerford silt loams
FvA	Freeland very fine sandy loam, 0 to 1 percent slopes
FvB	Freeland very fine sandy loam, 1 to 3 percent slopes
Fw	Frost silt loam
Je	Jeanerette silt loam
Jn	Jeanerette silt loam, acid variant
Jr	Jeanerette silt loam, light-colored variant
Jt	Jeanerette–Frost silt loams
Jv	Jeanerette, light-colored variant–Frost silt loams
La	Lafe silt loam
Lm	Loamy alluvial land and Mhoon soils, overflow
LoA	Loring silt loam, 0 to 1 percent slopes
LoB	Loring silt loam, 1 to 3 percent slopes
LoC2	Loring silt loam, 3 to 5 percent slopes, eroded
LoD2	Loring silt loam, 5 to 8 percent slopes, eroded
Ma	Made land
MeA	Memphis silt loam, 0 to 1 percent slopes
MeB	Memphis silt loam, 1 to 3 percent slopes
MeD2	Memphis silt loam, 3 to 8 percent slopes, eroded
Mh	Mhoon silty clay
Mn	Mhoon silty clay loam
Ms	Mhoon–Sharkey complex
Oc	Ochlockonee fine sandy loam, overflow
OlA	Olivier silt loam, 0 to 1 percent slopes
OlB	Olivier silt loam, 1 to 3 percent slopes
PrB	Providence silt loam, 1 to 3 percent slopes
Sc	Sharkey clay
Sh	Sharkey silty clay loam
Sk	Sharkey–Tunica association, overflow
Sm	Sharkey–Tunica clays, overflow
SmB	Sharkey–Tunica clays, undulating
So	Smoothed land, Dundee and Tensas materials
Sp	Springfield silt loam
Sr	Springfield–Olivier silt loams
Te	Terrace escarpments
Tn	Tunica clay
Ts	Tunica–Sharkey clays
Vd	Verdun silt loam
Ve	Verdun–Deerford silt loams
Vf	Verdun–Fred silt loams
Wf	Waverly–Falaya silt loams, overflow
Za	Zachary silt loam

WORKS AND STRUCTURES

Highways and roads
- Dual
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State or county

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail, foot
- Railroad
- Ferry FY
- Ford FORD
- Grade
- R. R. over
- R. R. under
- Tunnel

Buildings
- School
- Church
- Station

Mines and Quarries

Mine dump

Pits, gravel or other

Power line

Pipeline

Cemetery

Dams

Levee

Tanks

Well, oil or gas

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(48)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 19 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hydraquents (*Hydr*, meaning presence of water, plus *aquent*, the suborder of the Entisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hydraquents.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle size, mineral content, soil temperature regime, soil depth, and reaction. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, siliceous, superactive, nonacid, thermic Typic Hydraquents.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. There can be some variation in the texture of the surface layer or of the substratum within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" *(47)*. Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" *(48)* and in "Keys to Soil Taxonomy" *(50)*. Unless otherwise indicated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Arat Series

The Arat series consists of very poorly drained, slowly permeable, very fluid mineral soils. These soils formed in herbaceous material and loamy alluvium. They are in abandoned stream channels and in backswamps of major streams. These soils are ponded most of the time and are frequently flooded. Slopes are less than 1 percent. Soils of the Arat series are fine-silty, siliceous, nonacid, thermic Typic Hydraquents.

Arat soils commonly are near Bigbee and Morganfield soils. Both of these soils are in higher positions than the

Arat soils. Bigbee soils are excessively drained and sandy throughout the profile. Morganfield soils are well drained and are loamy and nonfluid throughout the profile.

Typical pedon of Arat muck; 2.2 miles northwest of Delombre, 2,000 feet west of Thompson Creek, 200 feet south of U.S. Highway 61; Spanish Land Grant sec. 69, T. 3 S., R. 2 W., West Feliciana Parish; USGS Port Hudson topographic quadrangle; latitude 30 degrees 44 minutes 48 seconds N.; longitude 91 degrees 17 minutes 29 seconds W.

Oa—0 to 5 inches; very dark grayish brown (10YR 3/2) muck; very fluid; common wood and moss fibers; moderately acid; clear wavy boundary.

A—5 to 12 inches; dark gray (10YR 4/1) silt loam; massive; very fluid; few wood fragments; neutral; clear wavy boundary.

Cg1—12 to 40 inches; gray (5Y 5/1) silty clay loam; massive; very fluid; few wood fragments; neutral; clear wavy boundary.

Cg2—40 to 60 inches; gray (5Y 5/1) silty clay loam; massive; very fluid; many logs and wood fragments; very strongly acid.

All mineral horizons have *n* value of 1 or more.

The Oa horizon has value of 2 to 4 and chroma of 1 or 2. Reaction ranges from strongly acid to slightly acid.

The A horizon has value of 2 to 4 and chroma of 1 or 2. Undecomposed logs and fragments of wood range from few to many. Texture is silty clay loam, mucky silty clay loam, silt loam, or mucky silt loam. Reaction ranges from strongly acid to neutral.

The Cg horizon has hue of 10YR, 2.5Y, or 5Y, value of 3 to 5, and chroma of 1 or 2. Undecomposed logs and fragments of wood range from few to many. Texture is silty clay loam, silt loam, or mucky silty clay loam. Reaction ranges from very strongly acid to neutral.

Bigbee Series

The Bigbee series consists of excessively drained, rapidly permeable soils that formed in sandy sediments. These soils are on low terraces along flood plains. Slopes range from 0 to 2 percent. Soils of the Bigbee series are thermic, coated Typic Quartzipsamments.

Bigbee soils commonly are near Loring, Memphis, Morganfield, Natchez, Ochlockonee, and Weyanoke soils. Loring, Memphis, Natchez, and Weyanoke soils are on terraces at a higher elevation than the Bigbee soils. Morganfield and Ochlockonee soils are on flood plains. Loring and Memphis soils are fine-silty; Morganfield, Natchez, and Weyanoke soils are coarse-silty; and Ochlockonee soils are coarse-loamy.

Typical pedon of Bigbee loamy sand, in an area of Morganfield and Bigbee soils, flooded; 2.1 miles west of Hardwood, 100 feet east of Bayou Sara, 100 feet south of a gravel road; Spanish Land Grant sec. 62, T. 3 S., R. 3 W., West Feliciana Parish; USGS St. Francisville topographic quadrangle; latitude 30 degrees 48 minutes 21 seconds N.; longitude 91 degrees 25 minutes 17 seconds W.

A—0 to 7 inches; brown (10YR 5/3) loamy sand; single grained; loose; few medium and coarse roots; moderately acid; clear smooth boundary.

C1—7 to 20 inches; light yellowish brown (10YR 6/4) loamy sand; single grained; loose; few medium and coarse roots; moderately acid; clear wavy boundary.

C2—20 to 36 inches; yellowish brown (10YR 5/4) loamy sand; single grained; loose; few coarse roots; moderately acid; clear wavy boundary.

C3—36 to 60 inches; light yellowish brown (10YR 6/4) sand; single grained; loose; few coarse roots; moderately acid.

The thickness of sand and loamy sand exceeds 80 inches. Reaction ranges from very strongly acid to moderately acid throughout the soil.

The A horizon has value of 3 or 4 and chroma of 2 to 4 or value of 4 or 5 and chroma of 3. It is 5 to 10 inches thick.

The upper part of the C horizon has hue of 10YR, 7.5YR, or 5YR, value of 5 to 7, and chroma of 4, 6, or 8. The lower part of the C horizon has value of 6 or 7 and chroma of 3 or 4. Texture is fine sand, sand, or loamy sand in the upper part of the C horizon and sand or fine sand in the lower part.

Bude Series

The Bude series consists of somewhat poorly drained soils that have a fragipan. Permeability is moderate in the upper part of the soil and slow in the fragipan. These soils formed in a silty mantle less than 4 feet thick and the underlying loamy sediments. They are on uplands. Slopes range from 0 to 2 percent. Soils of the Bude series are fine-silty, mixed, thermic Glossaquic Fragiudalfs.

Bude soils are similar to Fluker and Olivier soils and commonly are near Calhoun, Tangi, and Toula soils. Calhoun soils are poorly drained, are mainly in depressional areas, and are gray throughout the profile. Fluker and Olivier soils are on terraces and have mixed mineralogy. Tangi and Toula soils are in higher positions on the landscape than the Bude soils and do not have gray mottles in the upper part of the subsoil.

Typical pedon of Bude silt loam, 0 to 2 percent slopes; 4,000 feet southeast of Blairstown, 1,500 feet south of Highway 959, 0.25 mile north of Feliciana Eastern Railroad, 100 feet east of a gravel road; sec. 31, T. 3 S., R. 3 E., East Feliciana Parish; USGS Pride topographic quadrangle;

latitude 30 degrees 44 minutes 52 seconds N.; longitude 90 degrees 56 minutes 54 seconds W.

A—0 to 5 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; many fine and medium and few coarse roots; very strongly acid; clear smooth boundary.

E—5 to 11 inches; pale brown (10YR 6/3) silt loam; few medium faint light brownish gray (10YR 6/2) mottles; weak fine granular structure; friable; common fine and medium and few coarse roots; very strongly acid; clear wavy boundary.

Bw1—11 to 15 inches; light yellowish brown (10YR 6/4) silt loam; common fine distinct strong brown (7.5YR 5/6) and light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; friable; common fine and medium and few coarse roots; very strongly acid; clear wavy boundary.

Bw2—15 to 20 inches; light yellowish brown (10YR 6/4) silt loam; common medium distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 4/6) mottles; weak medium subangular blocky structure; friable; common fine, medium, and coarse roots; strongly acid; clear wavy boundary.

E/Bx—20 to 24 inches; light brownish gray (10YR 6/2) silt loam (E) and light yellowish brown (10YR 6/4) silt loam (Bx); common medium distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; few coarse roots; strongly acid; clear wavy boundary.

Btx1—24 to 27 inches; mottled light brownish gray (10YR 6/2), yellowish brown (10YR 5/6), and light yellowish brown (10YR 6/4) silt loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few faint clay films on faces of peds; few discontinuous light gray (10YR 7/1) silt loam seams about 1/4 inch wide surround prisms and make up about 15 percent of the volume; few fine and medium roots in seams between peds; strongly acid; gradual wavy boundary.

2Btx2—27 to 44 inches; mottled yellowish brown (10YR 5/6), light yellowish brown (10YR 6/4), light brownish gray (10YR 6/2), and strong brown (7.5YR 4/6) silty clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few faint clay films on faces of peds; few discontinuous light gray (10YR 7/1) silt loam seams about 1/4 inch wide surround prisms and make up about 15 percent of the volume; few fine and medium roots in seams between peds; strongly acid; gradual wavy boundary.

2Btx3—44 to 60 inches; mottled light yellowish brown (10YR 6/4) and light brownish gray (10YR 6/2) silt loam; moderate medium prismatic structure parting to weak medium subangular blocky; few faint clay films on faces of peds; firm; few discontinuous light gray (10YR 7/1) seams about 1/4 inch wide surround prisms and make up about 15 percent of the volume; few coarse roots in seams between peds; moderately acid.

The solum is more than 60 inches thick. Depth to the fragipan ranges from 18 to 40 inches. Gray mottles are within 16 inches of the soil surface. In at least one subhorizon within a depth of 30 inches, exchangeable aluminum makes up 50 percent or more of the effective cation-exchange capacity. Reaction ranges from very strongly acid to moderately acid throughout the solum, except for surface layers that have been limed.

The A horizon has value of 4 and chroma of 2 or 3 or value of 3 and chroma of 1. It is 4 to 8 inches thick.

The E horizon has value of 5 or 6 and chroma of 3 or value of 6 and chroma of 4.

The Bw horizon has hue of 10YR, value of 4 to 6, and chroma of 4, 6, or 8; or it has hue of 7.5YR, value of 5, and chroma of 6. Mottles with chroma of 2 or less are within the upper 10 inches of the Bw horizon. Texture is silt loam or silty clay loam. Between a depth of 10 inches and the upper boundary of the fragipan, clay content ranges from 18 to 30 percent and sand content is less than 15 percent.

The EB and BE horizons, where present, have hue of 10YR, value of 4 to 6, and chroma of 4 or value of 4 to 6, and chroma of 4, 6, or 8; or they have hue of 7.5YR, value of 5, and chroma of 6. Texture is silt loam or silty clay loam.

The E/Bx horizon is mottled in shades of brown, yellow, or gray. Clay content is less than that of the EB, BE, and Btx horizons.

The Btx horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2; or it is mottled in shades of brown, yellow, or gray. Texture is silt loam or silty clay loam.

The 2Btx horizon has the same colors as the Btx horizon. Texture is silt loam, silty clay loam, or clay loam.

Calhoun Series

The Calhoun series consists of poorly drained, slowly permeable soils that formed in loess or mixed loess and silty sediments. These soils are on terraces and on flood plains. They are subject to rare to frequent flooding. Slopes are less than 1 percent. Soils of the Calhoun series are fine-silty, mixed, thermic Typic Glossaqualfs.

Calhoun soils commonly are near Deerford, Loring, and Olivier soils. All of these soils are in higher positions on the landscape than the Calhoun soils. Deerford soils have a natric horizon. Loring and Olivier soils have a fragipan.

Typical pedon of Calhoun silt loam; 600 feet north of Highway 964, 7,700 feet east of Thompson Creek; Spanish Land Grant sec. 74, T. 3 S., R. 2 W., West Feliciana Parish; USGS Port Hudson topographic quadrangle; latitude

30 degrees 44 minutes 51 seconds N.; longitude 91 degrees 15 minutes 48 seconds W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) silt loam; weak fine granular structure; friable; many fine roots; very strongly acid; clear smooth boundary.

Eg1—7 to 13 inches; light brownish gray (10YR 6/2) silt loam; common fine distinct dark yellowish brown (10YR 4/4) mottles; weak fine platy structure; friable; many fine roots; strongly acid; clear smooth boundary.

Eg2—13 to 20 inches; light gray (10YR 7/1) silt loam; common medium distinct yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure; friable; common fine roots; very strongly acid; gradual wavy boundary.

Eg/Btg—20 to 25 inches; 80 percent light brownish gray (10YR 6/2) silt loam (Eg) and 20 percent grayish brown (10YR 5/2) silt loam (Btg); common medium distinct yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure; friable; few fine roots; the Btg material occurs as discontinuous prisms within the Eg material; few faint clay films on faces of peds; few black concretions; very strongly acid; gradual wavy boundary.

Btg/Eg—25 to 31 inches; 70 percent grayish brown (10YR 5/2) silt loam (Btg) and 30 percent light brownish gray (10YR 6/2) silt loam (Eg); common medium distinct yellowish brown (10YR 5/6 and 10YR 5/4) mottles; moderate very coarse prismatic structure parting to weak medium subangular blocky; friable; few fine roots; the Eg material occurs as tongues 2 to 5 inches wide between prisms; few faint clay films on faces of peds; very strongly acid; gradual wavy boundary.

Btg1—31 to 41 inches; grayish brown (10YR 5/2) silt loam; common medium distinct yellowish brown (10YR 5/6 and 10YR 5/4) mottles; moderate medium subangular blocky structure; firm; few faint clay films on faces of peds; common light gray (10YR 7/1) silt coats on ped faces; strongly acid; gradual wavy boundary.

Btg2—41 to 52 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; firm; few faint clay films on faces of peds; common light gray (10YR 7/1) silt coats on ped faces; many black concretions; very strongly acid; gradual wavy boundary.

BCg—52 to 60 inches; grayish brown (10YR 5/2) silt loam; many coarse distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; very strongly acid.

The thickness of the solum ranges from 40 to 80 inches. At least one subhorizon within a depth of 30 inches, exchangeable aluminum makes up 20 to 50 percent of the effective cation-exchange capacity.

The Ap horizon has value of 4 to 6 and chroma of 1 to 3. It is 5 to 10 inches. Reaction ranges from extremely acid to moderately acid.

The Eg horizon and the Eg part of the Eg/Btg and Btg/Eg horizons have hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 or 2. Reaction ranges from extremely acid to moderately acid.

The Btg horizon and the Btg part of the Eg/Btg and Btg/Eg horizons have hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. Texture is silt loam or silty clay loam. Reaction ranges from extremely acid to neutral.

The BCg horizon and the Cg horizon, where present, have hue of 10YR, 2.5Y, or 5Y, value of 5 or 6, and chroma of 1 to 3. Reaction ranges from extremely acid to slightly alkaline.

Cascilla Series

The Cascilla series consists of well drained, moderately permeable soils that formed in loamy alluvium. These soils are on flood plains and are frequently flooded. Slopes range from 0 to 2 percent. Soils of the Cascilla series are fine-silty, mixed, thermic Fluventic Dystrochrepts.

Cascilla soils commonly are near Calhoun, Deerford, and Olivier soils. Calhoun soils are on terraces and on flood plains. The soils on flood plains are in lower positions than the Cascilla soils. Calhoun soils are gray throughout the profile. Deerford and Olivier soils are on terraces. Deerford soils have a natric horizon, and Olivier soils have a fragipan.

Typical pedon of Cascilla silt loam, in an area of Calhoun and Cascilla silt loams, frequently flooded; 2.3 miles southwest of Slaughter, 1,700 feet north of parish line, 200 feet east of White Bayou; Spanish Land Grant sec. 52, T. 4 S., R. 1 W., West Feliciana Parish; USGS Port Hudson topographic quadrangle; latitude 30 degrees 44 minutes 51 seconds N.; longitude 91 degrees 15 minutes 48 seconds W.

A—0 to 6 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; common medium and coarse roots; very strongly acid; clear smooth boundary.

Bw1—6 to 19 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure; friable; common medium and coarse roots; very strongly acid; clear wavy boundary.

Bw2—19 to 40 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; common medium and coarse roots; very strongly acid; clear wavy boundary.

Bw3—40 to 50 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct yellowish brown (10YR 5/8) and pale brown (10YR 6/3) mottles; weak fine subangular blocky structure; friable; strongly acid; clear wavy boundary.

BC—50 to 60 inches; yellowish brown (10YR 5/6) silt loam; common medium distinct light brownish gray (10YR 6/2) mottles; weak fine subangular blocky structure; friable; very strongly acid.

The thickness of the solum ranges from 45 to 80 inches. In at least one subhorizon within a depth of 30 inches, exchangeable aluminum makes up 50 percent or more of the effective cation-exchange capacity. Reaction is very strongly acid or strongly acid throughout the solum, except for surface layers that have been limed.

The Ap horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 to 4. It is 5 to 8 inches thick. Some pedons have an A horizon less than 6 inches thick. Where present, it has hue of 10YR, value of 3, and chroma of 1 to 3.

The BA horizon, where present, has colors and texture similar to those of the Ap horizon.

The Bw horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 3, 4, or 6. Some pedons have few to common mottles in shades of gray below a depth of 24 inches from the surface. Texture is silt loam or silty clay loam. The clay content ranges from 18 to 30 percent. Some pedons have a few clay films in pores.

The BC horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 or 6. Most pedons have few or common mottles in shades of gray.

The 2C horizon, where present, has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 2, 3, 4, or 6; or it is mottled in shades of brown and gray. Texture is fine sandy loam, loam, or silt loam.

Commerce Series

The Commerce series consists of somewhat poorly drained, moderately slowly permeable soils. These soils formed in loamy alluvium. They are on the flood plains of the Mississippi River and its distributaries. Some soils are subject to occasional or frequent flooding, and others are protected from flooding by levees. Slopes range from 0 to 3 percent. Soils of the Commerce series are fine-silty, mixed, nonacid, thermic Aeric Fluvaquents.

Commerce soils commonly are near Convent, Fausse, Robinsonville, Sharkey, and Tunica soils. Convent and Robinsonville soils are in higher positions than the Commerce soils. Convent soils are coarse-silty, and Robinsonville soils are coarse-loamy. Fausse, Tunica, and Sharkey soils are in lower positions than the Commerce soils and have a clayey subsoil.

Typical pedon of Commerce silt loam; on Louisiana State Penitentiary Farm at Angola, about 72 feet southwest of farm road, 156 feet north of turnrow behind St. Augustine Church; Spanish Land Grant sec. 48, T. 1 S., R. 5 W., West Feliciana Parish; USGS Tunica topographic quadrangle: latitude 30 degrees 58 minutes 11 seconds N.; longitude 91 degrees 36 minutes 25 seconds W.

Ap—0 to 5 inches; dark brown (10YR 3/3) silt loam; weak fine granular structure; friable; strongly acid; clear smooth boundary.

Bw1—5 to 21 inches; dark grayish brown (10YR 4/2) silty clay loam; few fine distinct dark yellowish brown (10YR 4/4) mottles; weak fine subangular blocky structure; firm; neutral; clear smooth boundary.

Bw2—21 to 31 inches; grayish brown (10YR 5/2) silt loam; few fine distinct dark yellowish brown (10YR 4/4) mottles; weak fine subangular blocky structure; friable; slightly alkaline; clear smooth boundary.

C—31 to 60 inches; grayish brown (10YR 5/2) silty clay loam; common fine distinct dark yellowish brown (10YR 4/4) mottles; massive; friable; slightly alkaline.

The thickness of the solum ranges from 20 to 45 inches.

The Ap horizon has value of 3 to 5 and chroma of 1 to 3. It is 4 to 12 inches thick. Texture is silt loam or silty clay loam. Reaction ranges from strongly acid to moderately alkaline.

The Bw horizon and the BC horizon, where present, have hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. Texture is silt loam, loam, or silty clay loam. Reaction ranges from slightly acid to moderately alkaline.

Some pedons have a buried A horizon. Where present, it has colors and texture similar to those of the Ap horizon. Reaction ranges from neutral to moderately alkaline.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. Texture is silt loam, silty clay loam, loam, or very fine sandy loam. In some pedons, it is stratified. Thin layers of silty clay are in some pedons. Reaction ranges from neutral to moderately alkaline.

Convent Series

The Convent series consists of somewhat poorly drained, moderately permeable soils. These soils formed in loamy alluvium. They are on flood plains of the Mississippi River and its distributaries. These soils are protected from flooding by levees. Slopes range from 0 to 3 percent. Soils of the Convent series are coarse-silty, mixed, nonacid, thermic Aeric Fluvaquents.

Convent soils commonly are near Commerce, Robinsonville, Sharkey, and Tunica soils. Commerce, Sharkey, and Tunica soils are in lower positions than the Convent soils. Commerce soils are fine-silty. Sharkey and Tunica soils have a clayey subsoil. Robinsonville soils are in higher positions than the Convent soils and are coarse-loamy.

Typical pedon of Convent silt loam; on Louisiana State Penitentiary Farm at Angola, about 5,800 feet northeast of farm headquarters, 300 feet south of Lake Killarney;

Spanish Land Grant sec. 49, T. 1 S., R. 5 W., West Feliciana Parish; USGS Tunica topographic quadrangle; latitude 30 degrees 58 minutes 21 seconds N.; longitude 91 degrees 35 minutes 51 seconds W.

Ap1—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; many fine roots; many worm casts; neutral; clear smooth boundary.

Ap2—4 to 9 inches; brown (10YR 5/3) very fine sandy loam; weak fine granular structure; friable; many fine roots; many worm casts; slightly alkaline; clear smooth boundary.

C1—9 to 19 inches; grayish brown (10YR 5/2) very fine sandy loam; massive; friable; slightly alkaline; clear wavy boundary.

C2—19 to 32 inches; grayish brown (10YR 5/2) silt loam; few fine distinct yellowish brown (10YR 5/4) mottles; massive; friable; moderately alkaline; clear wavy boundary.

C3—32 to 60 inches; dark grayish brown (10YR 4/2) silt loam; massive; moderately alkaline.

The Ap horizon is silt loam in the upper part and silt loam, very fine sandy loam, or fine sandy loam in the lower part. It is 4 to 12 inches thick. Reaction ranges from moderately acid to moderately alkaline.

The C horizon has hue of 2.5Y or 10YR, value of 4 or 5, and chroma of 1 or 2. Some pedons have hue of 10YR, value of 3, 4, or 6, and chroma of 3; hue of 7.5YR, value of 4, and chroma of 2 to 4; or hue of 5YR, value of 4, and chroma of 2. Texture is silt loam or very fine sandy loam. Some pedons have thin layers of finer or coarser material, and some pedons have carbonates in some subhorizons below a depth of 20 inches. Reaction ranges from moderately acid to moderately alkaline.

Crevasse Series

The Crevasse series consists of excessively drained, rapidly permeable soils that formed in sandy alluvium. These soils are on the flood plains of the Mississippi River. They are subject to frequent flooding. Slopes range from 0 to 5 percent. Soils of the Crevasse series are mixed, thermic Typic Udipsamments.

Crevasse soils commonly are near Convent and Robinsonville soils. Both of these soils are in higher positions than the Crevasse soils. Convent soils are coarse-silty, and Robinsonville soils are coarse-loamy.

Typical pedon of Crevasse loamy sand, frequently flooded; about 5.7 miles northeast of Morganza, 4,900 feet southeast of Shaw Lake, 200 feet east of the Mississippi River; sec. 14, T. 3 S., R. 4 W., West Feliciana Parish; USGS Lacour topographic quadrangle; latitude 30 degrees 47 minutes 56 seconds N.; longitude 91 degrees 31 minutes 48 seconds W.

A—0 to 6 inches; brown (10YR 5/3) loamy sand; single grained; loose; few fine and medium roots; moderately alkaline; clear smooth boundary.

C1—6 to 40 inches; yellowish brown (10YR 5/4) loamy sand; single grained; loose; slightly alkaline; clear wavy boundary.

C2—40 to 60 inches; brown (10YR 5/3) loamy sand; single grained; loose; common bedding planes; slightly alkaline.

The A horizon has value of 4 to 7 and chroma of 2, 3, 4, or 6. It is 4 to 10 inches thick. Reaction ranges from moderately acid to moderately alkaline.

The C horizon has value of 4 to 6 and chroma of 2, 3, 4, or 6. Texture is sand, fine sand, loamy fine sand, or loamy sand. Reaction ranges from moderately acid to moderately alkaline.

Deerford Series

The Deerford series consists of somewhat poorly drained, slowly permeable soils that formed in silty sediments with low sand content. These soils are on terraces and are subject to rare flooding. Slopes range from 0 to 2 percent. Soils of the Deerford series are fine-silty, mixed, thermic Albic Glossic Natraqualfs.

Deerford soils commonly are near Calhoun, Loring, and Olivier soils. Calhoun soils are in lower positions than the Deerford soils and are gray throughout the profile. Loring soils are in higher positions or more sloping positions than the Deerford soils. Olivier soils are in positions similar to those of the Deerford soils. Both Loring and Olivier soils have a fragipan.

Typical pedon of Deerford silt loam, 0 to 2 percent slopes; about 1.85 miles southwest of Ethel, 1 mile east of Black Creek, 2,000 feet south of Highway 955; sec. 19, T. 3 S., R. 1 E., East Feliciana Parish; USGS Jackson topographic quadrangle; latitude 30 degrees 46 minutes 13 seconds N.; longitude 91 degrees 9 minutes 39 seconds W.

Ap—0 to 6 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; many fine roots; strongly acid; abrupt smooth boundary.

E—6 to 10 inches; light brownish gray (10YR 6/2) silt loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; weak fine subangular blocky structure; friable; many fine roots; moderately acid; clear irregular boundary.

Bt/E—10 to 16 inches; yellowish brown (10YR 5/4) silty clay loam (Bt); common medium distinct yellowish brown (10YR 5/8) and few medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; common fine roots; common vertical tongues of light brownish gray (10YR 6/2) silt loam (E) 2 to 4 inches wide; few faint clay films on surfaces of peds; few fine black concretions; moderately acid; clear wavy boundary.

Btn1—16 to 24 inches; light olive brown (2.5Y 5/6) silty clay loam; common medium distinct yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; gray (10YR 6/1) seams between prisms; few faint clay films on faces of peds; common fine iron and manganese concretions; moderately acid; gradual wavy boundary.

Btn2—24 to 34 inches; light olive brown (2.5Y 5/6) silt loam; common medium distinct yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; friable; few faint clay films on faces of peds; common fine black concretions; moderately acid; clear wavy boundary.

Btn3—34 to 60 inches; yellowish brown (10YR 5/6) silt loam; common coarse distinct pale brown (10YR 6/3) mottles; weak medium subangular blocky structure; friable; few thin clay films on faces of peds; common fine black concretions; neutral.

The thickness of the solum ranges from 40 to 80 inches. Depth to a subhorizon with more than 15 percent exchangeable sodium ranges from 16 to 34 inches.

The Ap horizon has value of 4 to 6 and chroma of 2 to 4. It is 3 to 11 inches thick. Reaction ranges from very strongly acid to slightly acid, except where limed.

The E horizon and the E part of the Bt/E horizon have hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 2 or 3. Texture is silt or silt loam. Reaction ranges from very strongly acid to slightly acid.

The Bt horizon and the Bt part of the Bt/E horizon have value of 4 to 6 and chroma of 3, 4, or 6. In some pedons, the interior of peds has chroma of 1 or 2. Texture is silty clay loam or silt loam. Reaction ranges from very strongly acid to slightly acid in the upper part of the horizon and neutral to moderately alkaline in the lower part.

The BC and C horizons, where present, have hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1, 2, 3, 4, or 6. Texture is silt loam or silty clay loam. Reaction ranges from neutral to moderately alkaline.

Dexter Series

The Dexter series consists of well drained, moderately permeable soils that formed in loess and underlying loamy and sandy sediments. These soils are on terraces. Slopes range from 1 to 3 percent. Soils of the Dexter series are fine-silty, mixed, thermic Ultic Hapludalfs.

Dexter soils commonly are near Calhoun, Fluker, Kenefick, and Olivier soils. Calhoun soils are poorly drained and are in depressional areas and on flood plains. Fluker and Olivier soils are in lower positions than the Dexter soils and have a fragipan. Kenefick soils are in landscape positions similar to those of the Dexter soils and are fine-loamy.

Typical pedon of Dexter silt loam, 1 to 3 percent slopes; on Idlewild Experiment Station, 4,000 feet northeast of headquarters, 50 feet east of turnrow; Spanish Land Grant sec. 44, T. 3 S., R. 2 E., East Feliciana Parish; USGS Bluff Creek topographic quadrangle; latitude 30 degrees 49 minutes 12 seconds N.; longitude 91 degrees 57 minutes 26 seconds W.

Ap1—0 to 5 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; many medium and fine roots; moderately acid; clear wavy boundary.

Ap2—5 to 9 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine granular structure; friable; many medium and fine roots; slightly acid; clear wavy boundary.

Bt1—9 to 16 inches; strong brown (7.5YR 4/6) silty clay loam; moderate medium subangular blocky structure; firm; many fine roots; few faint clay films on faces of peds; moderately acid; gradual wavy boundary.

Bt2—16 to 26 inches; reddish brown (5YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; few faint clay films on faces of peds; strongly acid; gradual wavy boundary.

Bt3—26 to 31 inches; reddish brown (5YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; few faint clay films on faces of peds; strongly acid; gradual wavy boundary.

2Bt4—31 to 41 inches; strong brown (7.5YR 4/6) loam; many coarse distinct dark brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; friable; few fine roots; few faint clay films on faces of peds; very strongly acid; gradual wavy boundary.

2Bt5—41 to 52 inches; dark brown (7.5YR 4/6) sandy loam; many coarse distinct strong brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; friable; few faint clay films on faces of peds; strongly acid; clear wavy boundary.

2Bt6—52 to 60 inches; brown (7.5YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; few faint clay films on faces of peds; very pale brown (10YR 8/4) streaks about 2 inches wide; very strongly acid; clear wavy boundary.

2BC—60 to 67 inches; strong brown (7.5YR 5/6) sandy loam; common medium distinct dark brown (7.5YR 4/4) and few medium distinct very pale brown (10YR 8/4) mottles; weak medium subangular blocky structure; friable; very strongly acid; gradual wavy boundary.

2C—67 to 80 inches; strong brown (7.5YR 5/6) loamy sand; common medium distinct very pale brown (10YR 8/4) and dark yellowish brown (10YR 4/4) mottles; massive; friable; very strongly acid.

The thickness of the solum ranges from 32 to more than 60 inches. In at least one subhorizon within a depth of about 30 inches, exchangeable aluminum makes up 20 to 50 percent of the effective cation-exchange capacity.

The Ap horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. It is 4 to 10 inches thick. Reaction ranges from very strongly acid to neutral.

The Bt and 2Bt horizons have hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 or 6. Texture is silt loam, silty clay loam, or clay loam in the Bt horizon and sandy loam or loam in the 2Bt horizon. Reaction ranges from very strongly acid to moderately acid.

The 2BC horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4 or 6. Texture is sandy loam, loam, clay loam, or sandy clay loam. Reaction ranges from very strongly acid to moderately acid.

The 2C horizon has colors similar to those of the 2BC horizon. Typically, the texture is fine sandy loam, loamy sand, or loamy fine sand, but ranges to sandy clay loam or clay loam. Reaction ranges from very strongly acid to moderately acid.

Fausse Series

The Fausse series consists of very poorly drained, very slowly permeable soils that formed in clayey alluvium. These soils are in low, ponded backswamp areas. They are subject to frequent flooding. Slopes are less than 1 percent. Soils of the Fausse series are very-fine, montmorillonitic, nonacid, thermic Typic Fluvaquents.

Fausse soils commonly are near Commerce, Sharkey, and Tunica soils. All of these soils are in higher positions than the Fausse soils. Commerce soils are fine-silty and somewhat poorly drained. Sharkey soils crack to a depth of 20 inches or more during dry periods in most years. Tunica soils have a loamy substratum.

Typical pedon of Fausse clay; 5.5 miles west of St. Francisville, 2.3 miles north of Mississippi River, 4,000 feet north of Lake Platt; sec. 14, T. 3 S., R. 4 W., West Feliciana Parish; USGS St. Francisville topographic quadrangle; latitude 30 degrees 46 minutes 43 seconds N.; longitude 91 degrees 28 minutes 53 seconds W.

A—0 to 5 inches; very dark gray (10YR 3/1) clay; weak fine subangular blocky structure; firm; very plastic; slightly alkaline; clear wavy boundary.

Bg1—5 to 20 inches; dark gray (10YR 4/1) clay; weak medium subangular blocky structure; firm; very plastic; slightly alkaline; gradual wavy boundary.

Bg2—20 to 32 inches; gray (10YR 5/1) clay; weak moderate subangular blocky structure; firm; very plastic; slightly alkaline; gradual wavy boundary.

Cg1—32 to 46 inches; gray (N 5/0) clay; few medium distinct dark yellowish brown (10YR 4/4) mottles; massive; firm; very plastic; slightly alkaline; gradual wavy boundary.

Cg2—46 to 60 inches; greenish gray (5BG 5/1) clay; massive; firm; very plastic; slightly alkaline.

Thickness of the solum ranges from 20 to 50 inches. The soil is saturated or above field capacity continuously in all layers below a depth of 24 inches in most years. Cracks do not form to a depth of 20 inches below the soil surface in most years.

Some pedons have a thin O horizon of muck on the surface. Where present, it has hue of 10YR, value of 2 or 3, and chroma of 1 or 2; or it has hue of 10YR, value of 4 and chroma of 1. Reaction ranges from moderately acid to neutral.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2; hue of 5Y, value of 4, and chroma of 1; or it is neutral and has value of 4. This horizon is less than 10 inches thick where the color is very dark gray or very dark grayish brown. Reaction ranges from moderately acid to slightly alkaline.

The Bg horizon has hue of 10YR, 5Y, or 5GY, value of 4 or 5, and chroma of 1; or it is neutral and has value of 4 or 5. Reaction ranges from slightly acid to moderately alkaline.

The Cg horizon has hue of 5Y, 5GY, or 5BG, value of 4 or 5, and chroma of 1; or it is neutral and has value of 5. Reaction ranges from neutral to moderately alkaline. Texture is clay or silty clay.

Feliciana Series

The Feliciana series consists of well drained, moderately permeable soils that formed in loess. These soils are on uplands. Slopes range from 0 to 40 percent. Soils of the Feliciana series are fine-silty, mixed, thermic Ultic Hapludalfs.

Feliciana soils commonly are near Calhoun, Loring, Natchez, and Olivier soils. Calhoun soils are in level areas, are poorly drained, and are gray throughout the profile. Loring and Olivier soils have less convex slopes than the Feliciana soils and have a fragipan. Natchez soils are coarse-silty and have steep, convex slopes.

Typical pedon of Feliciana silt loam, 0 to 1 percent slopes; 1.7 miles north of Delombre, 3,300 feet east of Thompson Creek, 150 feet south of Highway 964; Spanish Land Grant sec. 74, T. 3 S., R. 2 W., West Feliciana Parish; USGS Port Hudson topographic quadrangle; latitude 30 degrees 44 minutes 45 seconds N.; longitude 91 degrees 16 minutes 31 seconds W.

Ap—0 to 5 inches; brown (10YR 5/3) silt loam; weak fine granular structure; friable; many fine roots; few dark yellowish brown (10YR 4/4) root stains; extremely acid; clear smooth boundary.

Bt1—5 to 15 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; common fine roots; few faint clay films on faces of peds; very strongly acid; clear wavy boundary.

Bt2—15 to 29 inches; dark brown (7.5YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; few faint clay films on faces of peds; common fine roots; common light yellowish brown (10YR 6/4) silt coatings on peds; strongly acid; gradual wavy boundary.

Bt3—29 to 46 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; few faint clay films on faces of peds; few fine roots; common light yellowish brown (10YR 6/4) silt coatings on peds; moderately acid; gradual wavy boundary.

BC—46 to 65 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; few light yellowish brown (10YR 6/4) silt coatings on peds; strongly acid.

The thickness of the solum ranges from 48 to 78 inches. In at least one subhorizon within a depth of 30 inches, exchangeable aluminum makes up 20 to 60 percent of the effective cation-exchange capacity.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 1 to 4; or it has hue of 7.5YR, value of 4 or 5, and chroma of 4. This horizon is 2 to 8 inches thick. Reaction ranges from extremely acid to moderately acid, except where limed. Some pedons have a thin A horizon. Where present, it has hue of 10YR or 7.5YR, value of 3, and chroma of 2 or 3.

The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma 4 or 6. Typically, clay content in the upper 20 inches of the Bt horizon is 25 to 30 percent, but ranges from 20 to 35 percent. The sand content is less than 5 percent to a depth of 48 inches or more. Black coats and stains on ped faces of the Bt horizon range from none to many. Gray or light yellowish brown silt coatings in cracks or on faces of peds range from none to common. Texture is silt loam or silty clay loam. Reaction ranges from very strongly acid to moderately acid.

The BC horizon has the same colors and reaction as the Bt horizon.

Some pedons have a C horizon.

Fluker Series

The Fluker series consists of somewhat poorly drained soils that have a fragipan. Permeability is moderate in the upper part of the subsoil and slow in the fragipan. These soils formed in a silty mantle less than 4 feet thick and the underlying loamy sediments. They are on terraces and are subject to rare flooding. Slopes range from 0 to 2 percent. Soils of the Fluker series are fine-silty, siliceous, thermic Aquic Fraglossudalfs.

Fluker soils commonly are near Dexter, Guyton, Kenefick, Ochlockonee, Ouachita, and Toula soils. None of these soils has a fragipan, except the Toula soils. Dexter, Kenefick, and Toula soils are in higher positions than the Fluker soils. Guyton, Ochlockonee, and Ouachita soils are on flood plains. Toula soils do not have gray mottles in the upper part of the subsoil.

Typical pedon of Fluker silt loam, 0 to 2 percent slopes; about 1.9 miles southeast of Baker Cemetery, 1,050 feet east of Highway 63, 75 feet east of dirt road; Spanish Land Grant sec. 39, T. 3 S., R. 3 E., East Feliciana Parish; USGS Bluff Creek topographic quadrangle; latitude 30 degrees 47 minutes 28 seconds N.; longitude 90 degrees 53 minutes 32 seconds W.

Ap—0 to 6 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; friable; many fine and medium roots; very strongly acid; clear smooth boundary.

BE—6 to 12 inches; light yellowish brown (10YR 6/4) silt loam; common medium distinct yellowish brown (10YR 5/8) mottles; weak fine subangular blocky structure; friable; few fine roots; few black concretions; strongly acid; clear wavy boundary.

Bt1—12 to 20 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct yellowish brown (10YR 5/6) and many medium distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; firm; many fine and medium roots; few fine random discontinuous tubular pores; few faint clay films on faces of peds; moderately acid; clear smooth boundary.

Bt2—20 to 25 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct yellowish brown (10YR 5/8) and light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; few medium and coarse roots; many distinct clay films on faces of peds; few dark yellowish brown (10YR 4/4) stains on peds; common medium black concretions; strongly acid; clear wavy boundary.

Bt/E—25 to 31 inches; yellowish brown (10YR 5/4) silty clay loam (Bt); common medium distinct yellowish brown (10YR 5/8) and light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; many faint clay films on faces of peds; common vertical tongues of light brownish gray (10YR 6/2) silt loam (E) about 1½ inches wide comprising 20 percent of the horizon; moderately acid; gradual wavy boundary.

2Btx1—31 to 37 inches; strong brown (7.5YR 5/6) loam; few medium distinct light brownish gray (10YR 6/2) mottles; moderate very coarse prismatic structure parting to weak medium and fine subangular blocky;

very firm and brittle; few fine roots in light gray seams; few fine random discontinuous tubular pores; few faint clay films on faces of peds; common vertical seams of light gray (10YR 7/1) silt loam 1/2 inch wide surround prisms; few dark yellowish brown (10YR 4/4) stains on peds; strongly acid; gradual wavy boundary.

2Btx2—37 to 49 inches; strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) loam; moderate very coarse prismatic structure parting to weak fine subangular blocky; very firm and brittle; few faint clay films on faces of peds; common vertical seams of light gray (10YR 7/1) silt loam 1/4 to 1/2 inch wide surround prisms; strongly acid; gradual wavy boundary.

2Btx3—49 to 60 inches; yellowish brown (10YR 5/6) sandy loam; common medium distinct strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; very firm and brittle; few faint clay films on faces of peds; common vertical seams of light brownish gray (10YR 6/2) fine sandy loam 1/4 to 1/2 inch wide surround prisms; very strongly acid, gradual wavy boundary.

The solum is more than 60 inches thick. Depth to the fragipan ranges from 18 to 40 inches. In at least one subhorizon within a depth of 30 inches, exchangeable aluminum makes up 50 percent or more of the effective cation-exchange capacity. Reaction ranges from extremely acid to moderately acid throughout the solum, except for the surface layer in areas that have been limed.

The Ap horizon has value of 3 to 5 and chroma of 1 to 4. It is 3 to 8 inches. Where value is 3, the Ap horizon is less than 6 inches thick.

The BE horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3, 4, 6, or 8. Mottles in shades of brown or gray range from few to many. Fine or very fine black and brown concretions range from none to common.

The Bt horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3, 4, 6, or 8. Texture is silt loam or silty clay loam. Mottles in shades of brown or gray range from few to many. Fine and very fine black and brown concretions range from none to common.

The Bt part of the Bt/E horizon has value of 5 or 6 and chroma of 2, 3, 4, or 6. The E part of the Bt/E horizon has value of 6 or 7. Some pedons have a grayish E horizon or a mottled E/B horizon. Vertical tongues of E material range in width from 1/4 inch to 2 inches and make up 10 to 30 percent of the horizon. Texture of the Bt part of the Bt/E horizon is silt loam or silty clay loam. Brownish mottles range from few to many and from fine to coarse.

The 2Btx horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3, 4, or 6; or it has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 or 2. Texture is silt loam, sandy clay loam, loam, fine sandy loam, or sandy loam. Mottles in shades of brown or gray range from few to many. Total sand content is typically greater than 25 percent.

Some pedons have a 2B or 2BC horizon below the 2Btx horizon. Where present, these horizons have the same range in colors and reaction as the 2Btx horizon. Texture is sandy loam, fine sandy loam, or loam.

Frost Series

The Frost series consists of poorly drained, slowly permeable soils that formed in loess or silty sediments. These soils are in ponded depressional areas on terraces. Slopes are less than 1 percent. Soils of the Frost series are fine-silty, mixed, thermic Typic Glossaqualfs.

The Frost soils in East and West Feliciana Parishes are taxadjuncts to the Frost series because they are Ultisols rather than Alfisols. This difference, however, does not significantly affect the use and management of the soils.

Frost soils commonly are near Calhoun, Loring, and Olivier soils. All of these soils are in higher positions than the Frost soils. Calhoun soils do not have dark gray coatings on the faces of peds. Loring and Olivier soils have a fragipan.

Typical pedon of Frost silt loam, ponded; about 1.3 miles northwest of Flower Hill, 3,800 feet west of Highway 66; Spanish Land Grant sec. 89, T. 2 S., R. 3 W., West Feliciana Parish; USGS Weyanoke topographic quadrangle; latitude 30 degrees 53 minutes 29 seconds N.; longitude 91 degrees 26 minutes 5 seconds W.

A—0 to 4 inches; grayish brown (10YR 5/2) silt loam; weak fine granular structure; friable; many fine and medium roots; very strongly acid; clear smooth boundary.

Eg—4 to 15 inches; dark gray (10YR 4/1) silt loam; common fine distinct dark yellowish brown (10YR 4/4) mottles; weak fine granular structure; friable; many medium and coarse roots; very strongly acid; gradual irregular boundary.

Btg/Eg—15 to 21 inches; 70 percent grayish brown (10YR 5/2) silt loam (Btg) and 30 percent gray (10YR 5/1) silt loam (Eg); common medium distinct yellowish brown (10YR 5/6 and 10YR 5/4) mottles; moderate very coarse prismatic structure parting to weak medium subangular blocky; firm; few fine roots; the E material occurs as tongues 2 to 5 inches wide between prisms; dark gray (10YR 4/1) coats on faces of peds; few faint clay films on faces of peds; very strongly acid; clear wavy boundary.

Btg1—21 to 34 inches; gray (10YR 5/1) silty clay loam; common medium distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; common dark gray (10YR 4/1) coats on faces of peds; few faint clay films on faces of peds; strongly acid; clear wavy boundary.

Btg2—34 to 58 inches; gray (10YR 5/1) silt loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; firm; common dark gray (10YR 4/1) coats on faces of peds; few faint clay films on faces of peds; very strongly acid; clear wavy boundary.

BCg—58 to 60 inches; gray (10YR 5/1) silt loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; firm; strongly acid.

The thickness of the solum ranges from 48 to 72 inches.

The A horizon has value of 3 to 5 and chroma of 1 or 2. It is 3 to 6 inches thick. Reaction ranges from very strongly acid to slightly acid.

The Eg horizon and Eg part of the Btg/Eg horizon have value of 4 to 6 and chroma of 1 or 2. Reaction ranges from very strongly acid to slightly acid. Tongues of the Eg horizon that range in width from 1 to 6 inches penetrate the Btg horizon and extend to depths of 20 inches or more.

The Btg horizon and the Btg part of the Btg/Eg horizon have hue of 10YR to 5Y, value of 5 or 6, and chroma of 1 or 2. Mottles are in shades of gray and brown. Peds are partially coated with dark gray (10YR 4/1), very dark gray (10YR 3/1), or black (10YR 2/1) material. Texture is silt loam or silty clay loam. Reaction ranges from very strongly acid to moderately acid in the upper part of the Btg horizon and from very strongly acid to moderately alkaline in the lower part.

The BCg horizon and the Cg horizon, where present, are mottled in shades of gray and brown. Texture is silt loam, silty clay loam, or silty clay. Reaction is the same as the Btg horizon.

Guyton Series

The Guyton series consists of poorly drained, slowly permeable soils that formed in loamy sediments. These soils are on flood plains and are subject to frequent flooding. Slopes are less than 1 percent. Soils of the Guyton series are fine-silty, siliceous, thermic Typic Glossaqualfs.

Guyton soils commonly are near Dexter, Fluker, Kenefick, Ochlockonee, and Ouachita soils. Dexter, Fluker, and Kenefick soils are on local stream terraces. Dexter and Kenefick soils are well drained. Fluker soils are somewhat poorly drained and have a fragipan. Ochlockonee and Ouachita soils are in higher positions on the flood plain than the Guyton soils, are well drained, and are brownish throughout the profile.

Typical pedon of Guyton silt loam, in an area of Ouachita, Ochlockonee, and Guyton soils, frequently flooded; about 2.1 miles northwest of Grangeville, 6,000 feet west of the Amite River, 100 feet south of dirt road; Spanish Land Grant sec. 56, T. 3 S., R. 3 E., East Feliciana Parish; USGS Pine Grove topographic quadrangle; latitude 30 degrees 44 minutes 47 seconds N.; longitude 90 degrees 52 minutes 3 seconds W.

A—0 to 5 inches, dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; many medium and coarse roots; very strongly acid; abrupt smooth boundary.

Eg—5 to 25 inches; light brownish gray (10YR 6/2) silt loam; few medium distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; common medium and coarse roots; very strongly acid; gradual irregular boundary.

Btg/Eg—25 to 35 inches; gray (10YR 6/1) silty clay loam (Btg); common medium prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few distinct clay films on faces of peds; 30 percent gray (10YR 6/2) silt loam (Eg); common medium and coarse roots; very strongly acid; gradual irregular boundary.

Btg1—35 to 55 inches; gray (10YR 6/1) silty clay loam; many coarse prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few distinct clay films on faces of peds; very strongly acid; clear wavy boundary.

Btg2—55 to 65 inches; gray (10YR 6/1) clay loam; many coarse prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few distinct clay films on faces of peds; few medium brown concretions; very strongly acid; clear wavy boundary.

The thickness of the solum ranges from 50 to about 80 inches. In the particle-size control section, sand content, which is dominantly very fine sand, ranges from 10 to 40 percent. In at least one subhorizon within a depth of about 30 inches, exchangeable aluminum makes up 50 percent or more of the effective cation-exchange capacity.

The A horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 or 3. It is 3 to 8 inches thick. Reaction ranges from extremely acid to moderately acid, except for surface horizons that have been limed.

The Eg horizon and the Eg part of the Btg/Eg horizon have hue of 10YR or 2.5Y, value of 5 to 8, and chroma of 1 or 2. Texture is silt loam, loam, or very fine sandy loam. Reaction ranges from extremely acid to moderately acid.

The Btg horizon and the Btg part of the Btg/Eg horizon have hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. Texture is silt loam, silty clay loam, or clay loam. Reaction ranges from extremely acid to moderately acid.

The BCg or Cg horizons, where present, have the same colors as the Btg horizon. Texture is silt loam, silty clay loam, clay loam, or sandy clay loam. Reaction of the BCg horizon ranges from extremely acid to moderately acid. Reaction of the Cg horizon ranges from strongly acid to moderately alkaline.

Kenefick Series

The Kenefick series consists of well drained, moderately permeable soils that formed in loamy and sandy sediments. These soils are on terraces. Slopes range from 1 to 3 percent. Soils of the Kenefick series are fine-loamy, siliceous, thermic Ultic Hapludalfs.

Kenefick soils commonly are near Fluker, Guyton, Ochlockonee, and Ouachita soils. Fluker soils are in lower positions than the Kenefick soils and have a fragipan. Guyton, Ochlockonee, and Ouachita soils are on flood plains. Guyton soils are poorly drained, are fine-silty, and are gray throughout the profile. Ochlockonee and Ouachita soils are brownish throughout the profile and do not have an argillic horizon.

Typical pedon of Kenefick fine sandy loam, 1 to 3 percent slopes; about 2 miles northwest of Grangeville, 300 feet west of Highway 63, 100 feet south of dirt road; Spanish Land Grant sec. 56, T. 3 S., R. 3 E., East Feliciana Parish; USGS Pine Grove topographic quadrangle; latitude 30 degrees 44 minutes 46 seconds N.; longitude 90 degrees 51 minutes 35 seconds W.

Ap—0 to 4 inches; dark brown (10YR 4/3) fine sandy loam; weak fine granular structure; friable; many fine roots; slightly acid; clear smooth boundary.

A/B—4 to 8 inches; brown (10YR 5/3) fine sandy loam (A) and yellowish red (5YR 4/6) sandy clay loam (B); weak fine subangular blocky structure; friable; common fine roots; neutral; clear wavy boundary.

Bt1—8 to 22 inches; yellowish red (5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; friable; few fine roots; common distinct clay films on faces of peds; slightly acid; clear wavy boundary.

Bt2—22 to 42 inches; yellowish red (5YR 5/8) sandy clay loam; weak medium subangular blocky structure; friable; common distinct clay films on faces of peds; strongly acid; clear wavy boundary.

BC—42 to 58 inches; yellowish red (5YR 5/8) sandy loam; weak fine subangular blocky structure; friable; very strongly acid; clear wavy boundary.

C—58 to 70 inches; stratified light yellowish brown (10YR 6/4) and strong brown (7.5YR 5/8) loamy fine sand and fine sandy loam; massive; very friable; very strongly acid.

The thickness of the solum ranges from 40 to 70 inches.

The Ap horizon has value of 3 or 4 and chroma of 2 to 4. It is 3 to 8 inches thick. Reaction ranges from very strongly acid to slightly acid.

The A/B horizon and the E or E/B horizon, where present, have hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4. Texture is loamy fine sand or fine sandy loam. Reaction ranges from very strongly acid to neutral.

The Bt horizon has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 6 or 8. Texture is sandy clay loam, clay loam, or loam. Average clay content ranges from 20 to 34 percent. Reaction ranges from very strongly acid to slightly acid.

The BC horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 6 or 8. Texture is sandy loam or fine sandy loam. Reaction ranges from very strongly acid to moderately acid.

The C horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 4, 6, or 8. Texture is loamy fine sand, fine sandy loam, sand, or a combination of these textures in stratified layers. Some pedons have few to many pebbles. Reaction ranges from very strongly acid to moderately acid.

Latanier Series

The Latanier series consists of somewhat poorly drained, very slowly permeable soils. These soils formed in clayey and loamy alluvium. They are on flood plains and are subject to occasional flooding. Slopes range from 1 to 5 percent. The soils of the Latanier series are clayey over loamy, mixed, thermic Vertic Hapludolls.

Latanier soils commonly are near Moreland soils. Moreland soils are in lower positions than the Latanier soils and are fine-textured throughout.

Typical pedon of Latanier clay, in an area of Latanier-Moreland complex, undulating, occasionally flooded; 3,200 feet north of Lower Old River, 2,500 feet east of the Red River; Spanish Land Grant sec. 43, T. 1 N., R. 7 E., East Feliciana Parish; USGS Turnbull topographic quadrangle; latitude 31 degrees 1 minute 37 seconds N.; longitude 91 degrees 44 minutes 12 seconds W.

A—0 to 4 inches; dark brown (7.5YR 3/2) clay; weak medium subangular blocky structure; firm; common coarse and medium roots; slightly alkaline; clear wavy boundary.

Bw1—4 to 17 inches; dark reddish brown (5YR 3/3) clay; moderate medium subangular blocky structure; firm; common medium and coarse roots; strongly effervescent; slightly alkaline; gradual wavy boundary.

Bw2—17 to 27 inches; reddish brown (5YR 4/4) clay; moderate medium subangular blocky structure; firm; few coarse roots; slightly alkaline; clear wavy boundary.

2C—27 to 60 inches; reddish brown (5YR 4/3) stratified very fine sandy loam and silt loam; massive; friable; few coarse roots; slightly alkaline.

The thickness of the solum and depth to contrasting texture range from 20 to 40 inches. Reaction ranges from neutral to moderately alkaline throughout the solum.

The A horizon has hue of 5YR or 7.5YR and chroma of 2

3. It is 4 to 7 inches thick. Texture is clay, silty clay, or silty clay loam.

The Bw horizon has hue of 2.5YR or 5YR, value of 3 to 5, and chroma of 2 to 4. Texture is clay or silty clay. In some pedons, the Bw horizon is calcareous throughout.

The 2C horizon is monotextured or stratified very fine sandy loam, silt loam, or silty clay loam.

Loring Series

The Loring series consists of moderately well drained soils that have a fragipan. Permeability is moderate in the upper part of the soil and slow in the fragipan. These soils formed in loess. They are on uplands. Slopes range from 1 to 8 percent. Soils of the Loring series are fine-silty, mixed, thermic Typic Fragiudalfs.

The Loring soils commonly are near Calhoun, Feliciana, and Olivier soils. Calhoun soils are in level areas and are poorly drained. Feliciana soils have more convex slopes than the Loring soils and do not have a fragipan. Olivier soils are in level to very gently sloping areas and have gray mottles in the upper part of the subsoil.

Typical pedon of Loring silt loam, 1 to 3 percent slopes; about 3.25 miles southwest of Ethel, 5,000 feet west of Black Creek, 100 feet east of dirt road; Spanish Land Grant sec. 97, T. 3 S., R. 1 W., West Feliciana Parish; USGS Jackson topographic quadrangle; latitude 30 degrees 6 minutes 47 seconds N., longitude 91 degrees 11 minutes 25 seconds W.

Ap—0 to 6 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; many fine roots; extremely acid; clear wavy boundary.

BE—6 to 10 inches; yellowish brown (10YR 5/6) silt loam; weak fine subangular blocky structure; friable; many fine roots; strongly acid; clear wavy boundary.

Bt—10 to 23 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; few distinct clay films on faces of peds; common light yellowish brown (10YR 6/4) silt coats on faces of peds; slightly acid; clear wavy boundary.

Btx1—23 to 28 inches; dark yellowish brown (10YR 4/4) silt loam; moderate very coarse prismatic structure parting to moderate medium subangular blocky; firm and brittle prisms comprise 70 percent of the volume; few fine roots in seams; common fine random discontinuous tubular pores; pale brown (10YR 6/3) silt loam seams 1/4 inch wide between prisms; few distinct clay films on peds within prisms and on prisms; common fine black concretions; very strongly acid; gradual wavy boundary.

Btx2—28 to 39 inches; dark yellowish brown (10YR 4/4) silt loam; moderate very coarse prismatic structure parting to moderate medium subangular blocky; firm and brittle prisms comprise 70 percent of the volume; few fine roots in seams; common fine random discontinuous tubular pores; light brownish gray (10YR 6/2) silt loam seams 1/2 inch wide between prisms; few distinct clay films on peds within prisms and on prisms; common fine black concretions; very strongly acid; gradual wavy boundary.

Btx3—39 to 51 inches; yellowish brown (10YR 5/4) silt loam; moderate very coarse prismatic structure parting to moderate medium subangular blocky; firm and brittle prisms comprise 70 percent of the volume; few fine roots in seams; common fine random discontinuous tubular pores; light brownish gray (10YR 6/2) silt loam seams 1/4 inch wide between prisms; few faint clay films on peds within prisms and on prisms; common fine black concretions; strongly acid; gradual wavy boundary.

C—51 to 60 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct gray (10YR 5/1) mottles; massive; friable; strongly acid.

The thickness of the solum ranges from 45 to 75 inches. Depth to the fragipan ranges from 22 to 35 inches. Base saturation ranges from 35 to 65 percent in the B and C horizons. Sand content throughout the solum is usually less than 5 percent, but may range up to 15 percent. In at least one subhorizon within a depth of 30 inches, exchangeable aluminum makes up 20 to 60 percent of the effective cation-exchange capacity.

The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2, 3, 4, or 6. It is 4 to 8 inches thick. Reaction ranges from very strongly acid to moderately acid.

The BE and Bt horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 or 6. In some pedons, the lower part of the Bt horizon has gray mottles. Texture is silt loam or silty clay loam. Reaction ranges from very strongly acid to slightly acid.

The Btx and C horizons have the same color, texture, and reaction as the Bt horizon. Mottles in shades of yellow, brown, or gray range from none to many. Reaction ranges from very strongly acid to moderately acid.

Lytle Series

The Lytle series consists of well drained, moderately permeable soils that formed in a mantle of loess about 2 to 3 feet thick and in the underlying loamy and clayey sediments. These soils are on uplands. Slopes range from 1 to 8 percent. Soils of the Lytle series are fine-loamy, siliceous, thermic Typic Paleudults.

Lytle soils commonly are near Ruston, Smithdale, and Tangi soils. Ruston and Tangi soils are in positions similar to those of the Lytle soils. Smithdale soils have steeper slopes. Ruston and Smithdale soils have more than 15 percent fine, medium, and coarse sand in the upper part of the argillic horizon. Tangi soils have a fragipan.

Typical pedon of Lytle silt loam, 3 to 8 percent slopes; about 1.9 miles southeast of Woodland, 1,800 feet south of Highway 432, 100 feet east of dirt road; Spanish Land Grant sec. 39, T. 1 S., R. 3 E., East Feliciana Parish; USGS Woodland topographic quadrangle; latitude 30 degrees 56 minutes 39 seconds N.; longitude 90 degrees 54 minutes 19 seconds W.

Ap—0 to 6 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; many fine and medium and few coarse roots; very strongly acid; clear smooth boundary.

E—6 to 11 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; many fine and medium and few coarse roots; many fine pores; very strongly acid; abrupt smooth boundary.

Bt1—11 to 19 inches; yellowish red (5YR 4/6) silty clay loam; moderate medium subangular blocky structure; friable; few fine roots; many fine, medium, and coarse pores; common distinct clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt2—19 to 28 inches; reddish brown (5YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; common fine, medium, and coarse roots; few fine pores; common distinct clay films on faces of peds; strongly acid; clear wavy boundary.

Bt3—28 to 38 inches; yellowish red (5YR 4/6) loam; moderate medium subangular blocky structure; friable; few medium and coarse roots; common strong brown (7.5YR 5/6) uncoated sand grains; common distinct clay films on faces of peds; few fine pores; strongly acid; clear wavy boundary.

2Bt/E—38 to 46 inches; yellowish red (5YR 4/6) loam (2Bt); weak coarse prismatic structure parting to moderate medium subangular blocky; firm; common fine, medium, and coarse roots; common fine pores; 20 to 30 percent strong brown (7.5YR 5/6) uncoated sand grains (E); common distinct clay films on faces of peds; strongly acid; clear wavy boundary.

2B't1—46 to 56 inches; red (2.5YR 4/6) sandy clay loam; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; common fine pores; common strong brown (7.5YR 5/6) uncoated sand grains; common distinct clay films on faces of peds; strongly acid; clear wavy boundary.

2B't2—56 to 67 inches; red (2.5YR 4/8) sandy clay loam; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine pores; many pockets of strong brown (7.5YR 5/6) uncoated sand grains; common distinct clay films on faces of peds; strongly acid; clear wavy boundary.

2B't3—67 to 81 inches; red (2.5YR 4/6) sandy clay; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; common distinct clay films on faces of peds; few fine pores; strongly acid.

Solum thickness exceeds 60 inches. Reaction ranges from very strongly acid to moderately acid throughout the solum, except in areas that have been limed. In most pedons, in at least one subhorizon within a depth of 30 inches, exchangeable aluminum makes up 20 to 70 percent of the effective cation-exchange capacity.

The Ap horizon has value of 3 to 5 and chroma of 1 to 3. It is 4 to 9 inches thick. Where value is 3, the Ap horizon is less than 6 inches thick.

The E horizon has value of 5 or 6 and chroma of 3 or 4. Texture is silt loam or very fine sandy loam.

The Bt horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4, 6, or 8. Texture is silt loam, loam, or silty clay loam. Clay content commonly is 20 to 30 percent, but ranges from 18 to 35 percent. Brittle bodies near the contact of the loess and underlying sediments make up from 10 to 40 percent of the volume of the horizon.

The 2Bt part of the 2Bt/E horizon has the same colors as the Bt horizon. The E part of the 2Bt/E horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3, 4, or 6. Texture is sandy loam, loam, clay loam, or silt loam.

The 2B't horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 4, 6, or 8. Texture is loam, sandy clay loam, clay loam, or sandy clay. Most pedons have few to many pockets of sand or loamy sand in shades of brown or yellow.

Moreland Series

The Moreland series consists of somewhat poorly drained, very slowly permeable soils. These soils formed in clayey alluvium. They are on flood plains and are subject to occasional flooding. Slopes ranges from 0 to 1 percent. Soils of the Moreland series are fine, mixed, thermic Vertic Hapludolls.

Moreland soils commonly are near Latanier and Sharkey soils. Latanier soils are in slightly higher positions than the Moreland soils and have a loamy substratum. Sharkey soils are in positions similar to those of the Moreland soils and are dominantly gray throughout the profile.

Typical pedon of Moreland clay, in an area of Latanier-Moreland complex, undulating, occasionally flooded; about 3,200 feet north of Lower Old River, 2,600 feet east of the Red River; Spanish Land Grant sec. 43, T. 1 N., R. 7 E., East Feliciana Parish; Turnbull topographic quadrangle; latitude 31 degrees 1 minute 33 seconds N.; longitude 91 degrees 44 minutes 4 seconds W.

Ap—0 to 10 inches; dark reddish brown (5YR 3/2) clay; moderate medium granular structure; firm; few fine roots; slightly alkaline; clear wavy boundary.

Bw1—10 to 26 inches; reddish brown (5YR 4/4) clay;

moderate fine subangular blocky structure; firm; few fine roots; moderately alkaline; clear wavy boundary.

Bw2—26 to 30 inches; reddish brown (5YR 4/4) clay; moderate fine subangular blocky structure; firm; few fine roots; few seams of dark reddish brown (5YR 3/2) silty clay loam; moderately alkaline; clear wavy boundary.

Bss—30 to 45 inches; reddish brown (5YR 4/4) clay; moderate medium subangular blocky structure; firm; few slickensides; strongly effervescent; seams of dark reddish brown (10YR 3/2) silty clay loam; moderately alkaline; clear wavy boundary.

BC—45 to 60 inches; dark reddish brown (5YR 3/2) clay; weak fine subangular blocky structure; very dark grayish brown (10YR 3/2) silt loam in cracks; moderately alkaline.

The Ap horizon has hue of 5YR or 7.5YR and chroma of 2 or 3. It is 6 to 16 inches thick. Reaction ranges from slightly acid to slightly alkaline.

The Bw and Bss horizons have hue of 5YR or 2.5YR, value of 3 or 4, and chroma of 3 or 4. Texture is clay or silty clay. Reaction ranges from neutral to moderately alkaline. Some pedons have thin silt loam or silty clay loam strata in the B horizon.

The BC horizon has the same colors as the Bw horizon. Texture is clay, silty clay, or silty clay loam. Reaction ranges from neutral to moderately alkaline.

Morganfield Series

The Morganfield series consists of well drained, moderately permeable soils that formed in loamy alluvium. These soils are on flood plains and are frequently flooded. Slopes range from 0 to 2 percent. Soils of the Morganfield series are coarse-silty, mixed, nonacid, thermic Typic Udifluvents.

Morganfield soils commonly are near Bigbee, Calhoun, and Weyanoke soils. Bigbee soils are on natural levees along stream banks and are sandy throughout the profile. Calhoun and Weyanoke soils are on terraces. Calhoun soils are poorly drained and have an argillic horizon. Weyanoke soils have an organic matter content that decreases regularly with depth.

Typical pedon of Morganfield silt loam, in an area of Morganfield and Bigbee soils, frequently flooded; about 1.5 miles northwest of Bains, 200 feet north of Highway 66, 15 feet west of Bayou Sara; Spanish Land Grant sec. 40, T. 2 S., R. 3 W., West Feliciana Parish; USGS St. Francisville topographic quadrangle; latitude 30 degrees 50 minutes 42 seconds N.; longitude 91 degrees [illegible] minutes 19 seconds W.

[illegible]0 to 4 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; common medium and coarse roots; slightly acid; clear smooth boundary.

C1—4 to 26 inches; yellowish brown (10YR 5/4) silt; massive; very friable; common medium and coarse roots; common bedding planes; moderately acid; clear wavy boundary.

C2—26 to 50 inches; yellowish brown (10YR 5/4) silt loam; common medium faint pale brown (10YR 6/3) mottles; massive; very friable; common coarse roots; moderately acid; clear wavy boundary.

C3—50 to 60 inches; yellowish brown (10YR 5/4) very fine sandy loam; common medium faint pale brown (10YR 6/3) mottles; massive; very friable; few coarse roots; common medium black concretions; moderately acid.

Reaction ranges from moderately acid to slightly alkaline throughout the soil.

The A horizon has value of 4 or 5 and chroma of 2 to 4. Texture is silt, silt loam, or loam.

The C horizon has value of 4 or 5 and chroma of 3 or 4. Texture is silt, silt loam, or very fine sandy loam. Some pedons have mottles with chroma of 2 below a depth of 20 inches. Clay content of the 10- to 40-inch control section ranges from 5 to 18 percent, and total sand content ranges from 5 to 45 percent.

Natchez Series

The Natchez series consists of well drained, moderately permeable soils that formed in loess. These soils are on uplands. Slopes range from 12 to 60 percent. Soils of the Natchez series are coarse-silty, mixed, thermic Typic Eutrochrepts.

Natchez soils are similar to Weyanoke soils and commonly are near Feliciana and Loring soils. Feliciana and Loring soils are on upper side slopes and ridgetops and are fine-silty. Weyanoke soils are on stream terraces and do not have carbonates in the profile.

Typical pedon of Natchez silt loam, in an area of Feliciana and Natchez silt loams, steep; about 3.4 miles northeast of Tunica, 100 feet north of Highway 66, 500 feet east of Tunica Bayou, 100 feet east of a gravel road; Spanish Land Grant sec. 79, T. 1 S., R. 4 W., West Feliciana Parish; USGS Tunica topographic quadrangle; latitude 30 degrees 58 minutes 11 seconds N.; longitude 91 degrees 31 minutes 25 seconds W.

A—0 to 2 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; few medium and coarse roots; moderately acid; clear smooth boundary.

E—2 to 5 inches; yellowish brown (10YR 5/4) silt loam; weak fine granular structure; friable; few medium and coarse roots; very strongly acid; clear smooth boundary.

Bw1—5 to 11 inches; yellowish brown (10YR 5/6) silt loam;

weak medium subangular blocky structure; friable; few coarse roots; very strongly acid; gradual wavy boundary.

Bw2—11 to 41 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; friable; few coarse roots; strongly acid; gradual wavy boundary.

C—41 to 60 inches; yellowish brown (10YR 5/4) silt loam; massive; friable; few medium calcium carbonate concretions; few shell fragments; slightly alkaline.

The thickness of the solum ranges from 18 to 48 inches.

The A horizon has value of 3 or 4 and chroma of 1 or 2. Reaction ranges from strongly acid to neutral.

The E horizon has value of 4 or 5 and chroma of 2 to 4. Texture is silt or silt loam. Reaction ranges from very strongly acid to neutral.

The Bw horizon has value of 4 to 6 and chroma of 3, 4, or 6. Texture is silt or silt loam. Reaction ranges from very strongly acid to neutral.

The C horizon has the same texture and color as the Bw horizon. Content of shells or concretions of carbonates range from few to many. Reaction ranges from neutral to moderately alkaline.

Ochlockonee Series

The Ochlockonee series consists of well drained, moderately permeable soils that formed in loamy alluvium. These soils are on flood plains and are subject to frequent flooding. Slopes range from 1 to 3 percent. Soils of the Ochlockonee series are coarse-loamy, siliceous, acid, thermic Typic Udifluvents.

Ochlockonee soils are similar to Crevasse soils and commonly are near Dexter, Fluker, Guyton, Kenefick, and Ouachita soils. Crevasse soils are on the flood plains of the Mississippi River and are sandy throughout the profile. Dexter, Fluker, and Kenefick soils are on terraces. Guyton soils are in lower positions than the Ochlockonee soils. Ouachita soils are in positions similar to those of the Ochlockonee soils. Dexter, Fluker, Guyton, and Ouachita soils are fine-silty. Kenefick soils are fine-loamy.

Typical pedon of Ochlockonee fine sandy loam, in an area of Ouachita, Ochlockonee, and Guyton soils, frequently flooded; about 6.5 miles west of Darlington, 4,000 feet west of the Amite River, 150 feet south of Highway 10; Spanish Land Grant sec. 54, T. 2 S., R. 3 E., East Feliciana Parish; USGS Chipola topographic quadrangle; latitude 30 degrees 53 minutes 44 seconds N.; longitude 90 degrees 51 minutes 1 second W.

A—0 to 6 inches; brown (10YR 4/3) fine sandy loam; weak fine granular structure; friable; common medium and fine roots; extremely acid; clear wavy boundary.

C1—6 to 26 inches; yellowish brown (10YR 5/4) sandy loam; massive; very friable; common fine and medium roots; extremely acid; gradual wavy boundary.

C2—26 to 42 inches; light yellowish brown (10YR 6/4) loam; massive; very friable; few fine roots; very strongly acid; gradual wavy boundary.

C3—42 to 60 inches; dark yellowish brown (10YR 4/6) sandy loam; massive; very friable; few fine roots; few fine distinct pale brown (10YR 6/3) uncoated sand grains; extremely acid.

Reaction is extremely acid to strongly acid throughout the soil, except for A horizons that have been limed. In at least one subhorizon within a depth of 30 inches below the soil surface, exchangeable aluminum makes up 50 percent or more of the effective cation-exchange capacity.

The A horizon has hue of 10YR or 7.5YR, value of 3 to 6, and chroma of 2 to 4. It is 4 to 10 inches thick.

The C horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3, 4, or 6. Some pedons have mottles with value of 4 to 6 and chroma of 1 or 2 below a depth of 20 inches. Strata within the C horizon range from loamy sand to silty clay loam, but the 10- to 40-inch control section texture is sandy loam, silt loam, or loam and contains less than 18 percent clay and more than 15 percent sand coarser than very fine sand.

Olivier Series

The Olivier series consists of somewhat poorly drained, slowly permeable soils that formed in loess. These soils are on terraces. Slopes range from 0 to 3 percent. Soils of the Olivier series are fine-silty, mixed, thermic Aquic Fragiudalfs.

Olivier soils commonly are near Calhoun, Feliciana, and Loring soils. Calhoun soils are in lower positions than the Olivier soils, and Feliciana and Loring soils are in higher positions. Neither the Calhoun soils nor the Feliciana soils have a fragipan. Loring soils do not have grayish mottles in the upper part of the subsoil.

Typical pedon of Olivier silt loam, 1 to 3 percent slopes; about 1.5 miles southwest of Evergreen Church, 1,500 feet north of Haynes Cemetery; Spanish Land Grant sec. 107, T. 3 S., R. 1 W., West Feliciana Parish; USGS Jackson topographic quadrangle; latitude 30 degrees 45 minutes 58 seconds N.; longitude 91 degrees 10 minutes 33 seconds W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; many fine roots; very strongly acid; abrupt smooth boundary.

E—7 to 12 inches; light yellowish brown (10YR 6/4) silt loam; common medium distinct yellowish brown (10YR 5/6) and common fine distinct light brownish gray (10YR 6/2) mottles; weak fine subangular blocky structure; friable; few fine roots; few fine pores; few fine black stains; strongly acid; clear wavy boundary.

Bt1—12 to 19 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct yellowish brown (10YR 5/6) and common fine distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; friable; common distinct clay films on faces of peds; few fine roots; few fine pores; few fine black stains; strongly acid; clear wavy boundary.

Bt2—19 to 26 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct strong brown (7.5YR 5/6) and few medium faint light yellowish brown (10YR 6/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; common distinct clay films on faces of peds; few fine black stains; strongly acid; gradual wavy boundary.

Btx1—26 to 32 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct yellowish brown (10YR 5/6) and common medium distinct strong brown (7.5YR 5/6) mottles; weak very coarse prismatic structure; firm and brittle; few fine pores; about 20 percent light brownish gray (10YR 6/2) silt loam seams about 1/4 inch wide between vertical faces of prisms; few faint clay films on faces of peds; strongly acid; gradual wavy boundary.

Btx2—32 to 60 inches; yellowish brown (10YR 5/4) silt loam; moderate very coarse prismatic structure; firm and brittle; few fine pores; about 20 percent light brownish gray (10YR 6/2) silt loam seams about 1/2 inch wide between vertical faces of prisms; few faint clay films on faces of peds; strongly acid.

The thickness of the solum ranges from 48 to 96 inches. Depth to the fragipan ranges from 13 to 42 inches. The sand content, which is dominantly very fine sand, is less than 10 percent. In at least one subhorizon within 30 inches below the soil surface, exchangeable aluminum makes up 20 to 50 percent of the effective cation-exchange capacity.

The Ap horizon has value of 4 or 5 and chroma of 1 to 3. It is 4 to 7 inches thick. Reaction ranges from very strongly acid to slightly acid.

The E horizon has value of 5 or 6 and chroma of 2 to 4. Reaction ranges from very strongly acid to moderately acid.

The Bt horizon has value of 5 or 6 and chroma of 3, 4, 6, or 8. Texture is silt loam or silty clay loam. Reaction is very strongly acid or strongly acid.

Some pedons have a B/E horizon. Where present, the Bt part of the B/E horizon has the same colors and texture as the Bt horizon. The E part of the B/E horizon has the same colors and texture as the E horizon. Reaction is very strongly acid or strongly acid.

The Btx horizon has value of 4 to 5 and chroma of 3, 4, 6, or 8. Texture is silt loam or silty clay loam. Reaction ranges from very strongly acid to moderately acid.

Ouachita Series

The Ouachita series consists of well drained, moderately slowly permeable soils that formed in loamy alluvium. These soils are on flood plains and are frequently flooded. Slopes range from 1 to 3 percent. Soils of the Ouachita series are fine-silty, siliceous, thermic Fluventic Dystrochrepts.

Ouachita soils commonly are near Dexter, Fluker, Guyton, Kenefick, and Ochlockonee soils. Dexter, Fluker, and Kenefick soils are on terraces and have an argillic horizon. Guyton soils are in lower positions on the flood plain than the Ouachita soils and are gray throughout the profile. Ochlockonee soils are in positions similar to those of the Ouachita soils and are coarse-loamy.

Typical pedon of Ouachita silt loam, in an area of Ouachita, Ochlockonee, and Guyton soils, frequently flooded; about 6.5 miles west of Darlington, 400 feet west of the Amite River, 250 feet south of Highway 10; Spanish Land Grant sec. 55, T. 2 S., R. 3 E., East Feliciana Parish; USGS Chipola topographic quadrangle; latitude 30 degrees 53 minutes 16 seconds N.; longitude 90 degrees 51 minutes 27 seconds W.

A—0 to 7 inches; brown (10YR 5/3) silt loam; weak fine granular structure; friable; many fine, medium, and coarse roots; extremely acid; clear smooth boundary.

Bw1—7 to 15 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure; friable; many medium and coarse roots; extremely acid; clear wavy boundary.

Bw2—15 to 24 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak medium subangular blocky structure; friable; common medium and coarse roots; very strongly acid; clear wavy boundary.

Bw3—24 to 40 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; friable; common medium and coarse roots; light yellowish brown (10YR 6/4) material in root channels; very strongly acid; gradual wavy boundary.

BC—40 to 48 inches; yellowish brown (10YR 5/8) silt loam; common medium distinct strong brown (7.5YR 5/6), common medium prominent and pale brown (10YR 6/3), and common coarse distinct dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; friable; few coarse roots; very strongly acid; clear wavy boundary.

2C—48 to 60 inches; mottled yellowish brown (10YR 5/4, 5/6) and light brownish gray (10YR 6/2) fine sandy loam; massive; friable; common fine and medium gravel; very strongly acid.

The thickness of the solum ranges from 40 to 80 inches. The content of organic matter decreases irregularly with depth. In at least one subhorizon within 30 inches of the soil surface, exchangeable aluminum makes up 50 percent or more of the effective cation-exchange capacity.

The A horizon has value of 4 and chroma of 2 to 4 or value of 5 and chroma of 3. It is 1 to 7 inches thick. Reaction ranges from extremely acid to moderately acid, except where the surface layer has been limed.

The Bw horizon has value of 4 or 5 and chroma of 3, 4, 6, or 8. Texture is silt loam, loam, or silty clay loam. Reaction ranges from extremely acid to strongly acid.

Some pedons have a thin 2Ab or 2Egb horizon. Where present, these horizons are variable in texture and color. Typically, texture is silt loam, sandy loam, or loamy sand. Reaction is very strongly acid or strongly acid.

The BC horizon has the same colors as the Bw horizon. Mottles are in shades of brown or gray and range from none to common. Texture is silt loam, loam, or fine sandy loam. Reaction is very strongly acid or strongly acid.

The 2C horizon has the same colors as the Bw horizon, or it is mottled with these colors in shades of gray. Texture is fine sandy loam, loam, or silt loam. Reaction is very strongly acid or strongly acid.

Robinsonville Series

The Robinsonville series consists of well drained soils that formed in loamy and sandy alluvium. Permeability is moderate or moderately rapid. These soils are on the flood plains of the Mississippi River and its distributaries. They are subject to occasional flooding. Slopes range from 1 to 5 percent. Soils of the Robinsonville series are coarse-loamy, mixed, nonacid, thermic Typic Udifluvents.

Robinsonville soils commonly are near Commerce and Convent soils. Both of these soils are in lower positions than the Robinsonville soils. Commerce soils are fine-silty, and Convent soils are coarse-silty.

Typical pedon of Robinsonville fine sandy loam, in an area of Robinsonville and Convent soils, occasionally flooded; about 9.1 miles northwest of St. Francisville, 200 feet east of the Mississippi River, 5,300 feet northwest of Ratcliff Lake; Spanish Land Grant sec. 45, T. 2 S., R. 4 W., West Feliciana Parish; USGS Lacour topographic quadrangle; latitude 30 degrees 51 minutes 51 seconds N.; longitude 91 degrees 30 minutes 37 seconds W.

Ap—0 to 7 inches; brown (10YR 4/3) fine sandy loam; weak fine granular structure; friable; many fine roots; slightly alkaline; clear smooth boundary.

C1—7 to 17 inches; brown (10YR 5/3) loamy fine sand; massive; very friable; many fine roots; moderately alkaline; clear smooth boundary.

C2—17 to 24 inches; brown (10YR 4/3) fine sandy loam; massive; friable; moderately alkaline; clear smooth boundary.

C3—24 to 40 inches; brown (10YR 5/3) loamy fine sand; massive; very friable; moderately alkaline; clear smooth boundary.

C4—40 to 45 inches; brown (10YR 4/3) fine sandy loam; massive; friable; moderately alkaline; clear smooth boundary.

C5—45 to 50 inches; brown (10YR 4/3) fine sandy loam; few fine distinct strong brown (7.5YR 5/6) mottles; massive; friable; moderately alkaline; clear smooth boundary.

C6—50 to 60 inches; brown (10YR 5/3) loamy fine sand; massive; friable; moderately alkaline.

The Ap horizon has value of 3 to 5 and chroma 2 to 4. It is 4 to 8 inches thick. Where value is less than 3.5, the Ap horizon is less than 6 inches thick. Reaction ranges from slightly acid to moderately alkaline.

The C horizon has value of 4 and chroma of 2 to 4 or value of 5 or 6 and chroma of 3 or 4. Mottles having chroma of 2 or less, if present, are below a depth of 20 inches. Texture is stratified fine sandy loam, silt loam, loam, very fine sandy loam, loamy very fine sand, or loamy fine sand. The strata vary in thickness and arrangement within short distances. The 10- to 40-inch control section has 5 to 18 percent clay. Some pedons have a buried soil below a depth of 20 inches. Reaction ranges from slightly acid to moderately alkaline.

Ruston Series

The Ruston series consists of well drained, moderately permeable soils that formed in loamy sediments. These soils are on uplands. Slopes range from 1 to 5 percent. Soils of the Ruston series are fine-loamy, siliceous, thermic Typic Paleudults.

Ruston soils commonly are near Lytle, Smithdale, and Tangi soils. Lytle and Tangi soils are on sloping positions similar to those of the Ruston soils. Lytle soils contain less total sand in the upper part of the solum than the Ruston soils. Tangi soils are fine-silty. Smithdale soils are on steeper slopes and do not have a bisequum in the profile.

Typical pedon of Ruston sandy loam, 1 to 5 percent slopes; about 4.5 miles east of Norwood, 3,200 feet southeast of Richland Creek, 1,550 feet northeast of parish road; Spanish Land Grant sec. 88, T. 1 S., R. 2 E., East Feliciana Parish; USGS Clinton topographic quadrangle; latitude 30 degrees 58 minutes 2 seconds N.; longitude 91 degrees 1 minute 48 seconds W.

A—0 to 2 inches; dark grayish brown (10YR 4/2) sandy loam; weak fine granular structure; friable; common fine and medium roots; extremely acid; clear smooth boundary.

E—2 to 4 inches; yellowish brown (10YR 5/4) sandy loam; weak fine granular structure; friable; common fine and medium roots; extremely acid; clear smooth boundary.

Bt1—4 to 24 inches; yellowish red (5YR 5/8) clay loam, moderate medium subangular blocky structure; firm; common medium, fine, and coarse roots; many distinct clay films on faces of peds; very strongly acid; gradual wavy boundary.

Bt2—24 to 35 inches; yellowish red (5YR 5/8) clay loam; weak fine subangular blocky structure; friable; few coarse roots; many distinct clay films on faces of peds; very strongly acid; gradual wavy boundary.

Bt/E—35 to 45 inches; yellowish red (5YR 5/6) sandy loam (Bt) makes up 70 percent of the horizon; weak medium subangular blocky structure; friable; pockets of yellowish brown (10YR 5/4) sandy loam (E) about 1½ inches in diameter make up 30 percent of the horizon; few faint clay films on faces of peds; very strongly acid; gradual wavy boundary.

B′t—45 to 60 inches; yellowish red (5YR 5/8) clay loam; weak medium subangular blocky structure; firm; few fine roots; common distinct clay films on faces of peds; few pockets of strong brown (7.5YR 5/6) uncoated sand grains; very strongly acid.

The solum is more than 60 inches thick. The B/E horizon is definitive for the series. In at least one subhorizon within a depth of about 30 inches below the soil surface, exchangeable aluminum makes up 50 percent or more of the effective cation-exchange capacity.

The A horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 4. It is 2 to 6 inches thick. Reaction ranges from extremely acid to slightly acid.

The E horizon has value of 5 or 6 and chroma of 3 or 4. Texture is fine sandy loam or sandy loam. Reaction ranges from extremely acid to slightly acid. Some pedons have a thin BE horizon.

The Bt horizon, Bt part of the Bt/E horizon, and the B′t horizon have hue of 5YR or 2.5YR, value of 4 to 6, and chroma of 4, 6, or 8. Texture is sandy clay loam, fine sandy loam, loam, or clay loam. The E part of the Bt/E horizon has value of 5 or 6 and chroma of 3 or 4. Texture is fine sandy loam, clay loam, or sandy loam. Some subhorizons contain as much as 15 percent, by volume, of gravel. Reaction ranges from very strongly acid to moderately acid.

Sharkey Series

The Sharkey series consists of poorly drained, very slowly permeable soils that formed in clayey alluvium. These soils are on flood plains of the Mississippi River and its distributaries. Unless protected by earthen levees, these soils are subject to rare or frequent flooding. Slopes are less than 1 percent. Soils of the Sharkey series are very-fine, montmorillonitic, nonacid, thermic Vertic Haplaquepts.

Sharkey soils commonly are near Commerce, Fausse, and Tunica soils. Commerce and Tunica soils are in slightly higher positions than the Sharkey soils. Commerce soils are fine-silty. Tunica soils have a loamy substratum. Fausse soils are in lower positions than the Sharkey soils, are very poorly drained, remain wet throughout the year, and do not crack to a depth of 20 inches.

Typical pedon of Sharkey clay; on Louisiana State Penitentiary Farm at Angola, 460 feet west of drainage pumping station, 1,900 feet north of levee; southeast corner of Spanish Land Grant sec. 56, T. 1 S., R. 5 W., West Feliciana Parish; USGS Tunica topographic quadrangle; latitude 30 degrees 56 minutes 39 seconds N.; longitude 91 degrees 35 minutes 37 seconds W.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) clay; weak fine and very fine subangular blocky structure; firm; very plastic; moderately acid; clear smooth boundary.

A—6 to 9 inches; very dark grayish brown (10YR 3/2) clay; few fine distinct dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; very firm; very plastic; neutral; clear smooth boundary.

Bg1—9 to 19 inches; dark gray (10YR 4/1) clay; common fine distinct dark yellowish brown (10YR 4/4) mottles; moderate medium and coarse subangular blocky structure; very firm; very plastic; shiny faces on peds; neutral; clear smooth boundary.

Bg2—19 to 27 inches; dark gray (10YR 4/1) clay; common fine distinct dark yellowish brown (10YR 4/4) mottles; moderate very coarse prismatic structure; very firm; very plastic; few shiny pressure faces; neutral; gradual wavy boundary.

Bssg1—27 to 42 inches; dark gray (10YR 4/1) clay; common fine distinct dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; very firm; very plastic; common slickensides that do not intersect; shiny faces on peds; slightly alkaline; gradual wavy boundary.

Bssg2—42 to 60 inches; gray (10YR 5/1) clay; common medium distinct dark brown (5YR 3/4) and dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; very firm; very plastic; common slickensides that do not intersect; shiny faces on peds; slightly alkaline.

The thickness of the solum ranges from 36 to more than 60 inches. Cracks, ½ inch to 2 inches wide, develop to a depth of 20 inches or more during dry periods of most years.

The Ap and A horizons have value of 2 and chroma of 1 or value of 3 or 4 and chroma of 1 or 2. Texture is clay or silty clay. The combined thickness of the Ap and A horizons ranges from 4 to 15 inches. Reaction ranges from strongly acid to moderately alkaline.

The Bg and Bssg horizons have hue of 10YR or 5Y, value of 4 to 6, and chroma of 1 or 2; or they are neutral and have value of 4 or 5. Reaction ranges from moderately acid to moderately alkaline. Some pedons have a thin silty clay loam or silt loam B subhorizon. Other pedons have a clayey, buried A horizon below a depth of 20 inches.

Some pedons have a Cg horizon. Where present, it has the same colors as the Bg horizon. Texture is clay or silty clay. Reaction ranges from neutral to moderately alkaline.

Smithdale Series

The Smithdale series consists of well drained, moderately permeable soils that formed in loamy sediments. These soils are on uplands. Slopes range from 8 to 30 percent. Soils of the Smithdale series are fine-loamy, siliceous, thermic Typic Hapludults.

Smithdale soils commonly are near Lytle, Ruston, and Tangi soils. All of these soils are on less sloping positions than the Smithdale soils. Lytle and Tangi soils are fine-silty. Ruston soils have a bisequum in the solum.

Typical pedon of Smithdale sandy loam, 8 to 30 percent slopes; about 1 mile west of the Amite River, 4,300 feet north of Hatcherville, 150 feet west of parish road; Spanish Land Grant sec. 38, T. 2 S., R. 3 E., East Feliciana Parish; USGS Hatcherville topographic quadrangle; latitude 30 degrees 50 minutes 28 seconds N.; longitude 90 degrees 51 minutes 54 seconds W.

A—0 to 2 inches; dark grayish brown (10YR 4/2) sandy loam; weak fine granular structure; friable; many fine roots; very strongly acid; abrupt smooth boundary.

E—2 to 8 inches; yellowish brown (10YR 5/4) sandy loam; weak fine granular structure; friable; many fine roots; very strongly acid; clear wavy boundary.

Bt1—8 to 15 inches; yellowish red (5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; friable; many fine roots; common distinct clay films on faces of peds; very strongly acid; clear wavy boundary.

Bt2—15 to 22 inches; red (2.5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; friable; few fine roots; common distinct clay films on faces of peds; very strongly acid; clear wavy boundary.

Bt3—22 to 44 inches; red (2.5YR 5/6) sandy clay loam; moderate medium subangular blocky structure; friable; common distinct clay films on faces of peds; many strong brown (7.5YR 5/6) uncoated sand grains; very strongly acid; clear wavy boundary.

Bt4—44 to 68 inches; red (2.5YR 5/6) sandy loam; weak medium subangular blocky structure; friable; few faint clay films on faces of peds; common fine and medium gravel; very strongly acid.

The thickness of the solum ranges from 60 to 120 inches. Reaction is very strongly acid or strongly acid throughout the solum, except for surface horizons that have been limed. In at least one subhorizon within 30 inches below the soil surface, exchangeable aluminum makes up 50 percent or more of the effective cation-exchange capacity.

The A horizon has value of 4 and chroma of 1 to 3. It is 2 to 10 inches thick. Some pedons have a thin A horizon. Where present, it has value of 3 and chroma of 1 or 2.

The E horizon has value of 5 or 6 and chroma of 2 to 4. Texture is fine sandy loam or sandy loam. Typically, this horizon is 2 to 8 inches thick; however, some pedons do not have an E horizon.

Some pedons have a BA or EB horizon. Where present, these horizons have hue of 7.5YR, 10YR, or 5YR, value of 4 or 5, and chroma of 4, 6, or 8. Texture is fine sandy loam or sandy loam.

The upper part of the Bt horizon has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 6 or 8. Texture is clay loam, sandy clay loam, or loam. The lower part of the Bt horizon has value of 4 or 5 and chroma of 6 or 8. Texture is loam or sandy loam. Gravel content in the Bt horizon ranges from 0 to 10 percent. In some pedons, the Bt horizon has mottles in shades of brown.

Tangi Series

The Tangi series consists of moderately well drained soils that have a fragipan. Permeability is moderate in the upper part of the subsoil and slow and very slow in the fragipan. These soils formed in a moderately thick mantle of loess over loamy and clayey sediments. They are on uplands. Slopes range from 1 to 8 percent. Soils of the Tangi series are fine-silty, siliceous, thermic Typic Fragiudults.

Tangi soils commonly are near Bude, Fluker, Lytle, Ruston, Smithdale, and Toula soils. Bude and Fluker soils are nearly level, somewhat poorly drained, and have gray mottles in the upper part of the subsoil. Lytle and Ruston soils are in positions similar to those of the Tangi soils. Smithdale soils are on steeper side slopes than the Tangi soils. Lytle, Ruston, and Smithdale soils do not have a fragipan. Toula soils have longer and less convex slopes than the Tangi soils and contain less sand and less clay in the fragipan.

Typical pedon of Tangi silt loam, 1 to 3 percent slopes; on Idlewild Experiment Station, 2,300 feet southeast of headquarters, 60 feet north of main road; Spanish Land Grant sec. 46, T. 3 S., R. 2 E., East Feliciana Parish; USGS Bluff Creek topographic quadrangle; latitude 30 degrees 48 minutes 50 seconds N.; longitude 90 degrees 57 minutes 42 seconds W.

Ap—0 to 5 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; many fine and common medium and coarse roots; strongly acid; clear smooth boundary.

Bt1—5 to 12 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; many fine and few medium and coarse roots; few faint clay films on faces of peds; slightly acid; clear wavy boundary.

Bt2—12 to 20 inches; yellowish brown (10YR 5/8) silt loam; weak medium subangular blocky structure; friable; common fine roots; few fine pores; few faint clay films on faces of peds; many fine and medium manganese concretions; very strongly acid; clear wavy boundary.

2Btx1—20 to 24 inches; brownish yellow (10YR 6/6) silt loam; common medium distinct strong brown (7.5YR 5/6) mottles; weak very coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots in seams between prisms; common fine pores; few faint clay films on faces of peds; many fine and medium manganese concretions; about 20 percent brittle bodies; very strongly acid; clear wavy boundary.

2Btx2—24 to 32 inches; strong brown (7.5YR 5/6) loam; moderate very coarse prismatic structure parting to moderate medium subangular blocky; firm and brittle; common fine roots in seams between prisms; many fine pores; light brownish gray (10YR 6/2) vertical and horizontal seams of silt loam and uncoated sand grains surrounding some peds; common distinct clay films on faces of peds; very strongly acid; clear wavy boundary.

2Btx3—32 to 41 inches; strong brown (7.5YR 5/6) loam; common coarse prominent red (2.5YR 5/6) mottles; moderate very coarse prismatic structure parting to moderate medium subangular blocky; firm and brittle; common fine roots in seams; common fine pores; few vertical light brownish gray (10YR 6/2) silt loam seams about 1 inch thick between peds; common distinct clay films on faces of peds; few chert pebbles; extremely acid; clear wavy boundary.

2Btx4—41 to 58 inches; mottled strong brown (7.5YR 5/6) and red (2.5YR 4/6) clay loam; moderate very coarse prismatic structure parting to moderate medium subangular blocky; firm and brittle; few medium roots in seams between prisms; common fine pores; seams of light brownish gray (10YR 6/2) silty clay loam between peds; common distinct clay films on faces of peds; extremely acid; gradual wavy boundary.

2Btx5—58 to 63 inches; red (2.5YR 4/6) clay; weak coarse and very coarse prismatic structure parting to moderate medium subangular blocky; firm and brittle; few fine roots in seams between prisms; many bodies of friable, yellowish brown (10YR 5/6) silty clay loam about 1/4 to 1/2 inch wide; few light brownish gray (10YR 6/2) seams of silt loam and uncoated sand grains on vertical faces of peds; common distinct clay films on faces of peds; extremely acid.

2B't—63 to 80 inches; red (2.5YR 4/6) sandy clay; few medium prominent strong brown (7.5YR 5/6) streaks and mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; common distinct clay films on faces of peds; extremely acid.

The solum is more than 60 inches thick. Depth to the fragipan ranges from 18 to 38 inches. Content of total sand in the family textural control section ranges from 10 to 25 percent. Less than 15 percent of the sand in the family textural control section is fine sand or coarser. In at least one subhorizon within a depth of 30 inches, exchangeable aluminum makes up 13 to 70 percent of the effective cation-exchange capacity.

The Ap horizon has value of 3 to 5 and chroma of 1 to 4. It is 3 to 7 inches thick. Where value is 3, the Ap horizon is less than 6 inches thick. Reaction ranges from very strongly acid to moderately acid, except where lime has been added.

Some pedons have a thin silt loam BE horizon. Where present, it has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3, 4, 6, or 8. Reaction ranges from very strongly acid to slightly acid.

The Bt horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 4, 6, or 8. Mottles in shades of brown range from none to common. Reaction ranges from very strongly acid to slightly acid.

The 2Btx horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4, 6, or 8; or it has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 4, 6, or 8. Mottles in shades of brown, gray, or red range from few to many. Texture is silt loam, loam, silty clay loam, clay loam, sandy clay loam, sandy clay, or clay. Content of total sand ranges from 25 to 60 percent. Content of clay ranges from 20 to 55 percent. At least one subhorizon of the 2Btx horizon contains more than 35 percent clay. Reaction ranges from extremely acid to moderately acid.

The 2B't horizon has the same colors, texture, and reaction as the 2Btx horizon. Some pedons do not have a 2B't horizon.

Toula Series

The Toula series consists of moderately well drained soils that have a fragipan. Permeability is moderate in the upper part of the subsoil and slow in the fragipan. These soils formed in a moderately thick mantle of loess over loamy sediment. They are on uplands. Slopes range from 1 to 3 percent. Soils of the Toula series are fine-silty, siliceous, thermic Typic Fragiudults.

Toula soils commonly are near Bude, Calhoun, and Tangi soils. Bude and Calhoun soils are in lower positions than the Toula soils. Bude soils are somewhat poorly drained and have grayish mottles in some part of the upper 16 inches of the soil. Calhoun soils are poorly drained and are grayish throughout the profile. Tangi soils are in more sloping areas than the Toula soils and have a subsoil that is red and clayey in the lower part.

Typical pedon of Toula silt loam, 1 to 3 percent slopes; about 2.9 miles northeast of Pride, 2,600 feet west of Scalous Creek, 1,100 feet north of East Baton Rouge parish line; Spanish Land Grant sec. 61, T. 4 S., R. 3 E., East Feliciana Parish; USGS Pride topographic quadrangle; latitude 30 degrees 43 minutes 7 seconds N.; longitude 91 degrees 28 minutes 58 seconds W.

A—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; common fine and few medium and coarse roots; very strongly acid; clear smooth boundary.

BE—4 to 7 inches; light yellowish brown (10YR 6/4) silt loam; weak medium subangular blocky structure; friable; few fine and few medium and coarse roots; very strongly acid; clear wavy boundary.

Bt—7 to 27 inches; yellowish brown (10YR 5/8) silty clay loam; moderate medium subangular blocky structure; friable; few medium and coarse roots; few faint clay films on faces of peds; very strongly acid; clear wavy boundary.

Btx1—27 to 35 inches; yellowish brown (10YR 5/6) silt loam; moderate coarse and very coarse prismatic structure parting to moderate medium subangular blocky; firm and brittle; light brownish gray (10YR 6/2) seams of silt loam surround prisms and make up about 20 percent of the volume; few faint clay films on faces of peds; very strongly acid; clear wavy boundary.

2Btx2—35 to 50 inches; yellowish brown (10YR 5/8) silt loam; moderate coarse and very coarse prismatic structure parting to moderate medium subangular blocky; light brownish gray (10YR 6/2) silt loam seams surround prisms and make up 20 to 30 percent of the volume; few faint clay films on faces of peds; very strongly acid; clear wavy boundary.

2B't—50 to 65 inches; yellowish brown (10YR 5/8) clay loam; few medium prominent red (2.5YR 4/8) mottles; weak medium subangular blocky structure; compact and brittle; few faint clay films on faces of peds; very strongly acid.

The solum is more than 60 inches thick. Depth to the fragipan ranges from 18 to 38 inches. Depth to mottles having chroma of 2 or less is typically greater than 20 inches, but ranges from 17 to 30 inches. Content of total sand in the textural family control section (Bt horizon) typically is less than 15 percent and ranges from 5 to 25 percent. Less than 15 percent of the sand in the textural family control section is fine sand or coarser. In at least one subhorizon within a depth of 30 inches, exchangeable aluminum makes up 50 percent or more of the effective cation-exchange capacity. Reaction ranges from very strongly acid to moderately acid throughout the solum, except in areas that have been limed.

The A horizon has value of 3 to 5 and chroma of 1 to 4. It is 3 to 7 inches thick. Where the value is 3, the A horizon is less than 6 inches thick.

The BE horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma 3, 4, 6, or 8.

The Bt horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 4, 6, or 8. Texture is silt loam or silty clay loam. Mottles are in shades of brown and red and range from none to many. Some pedons have gray mottles below a depth of 16 inches from the soil surface.

The Btx and 2Btx horizons have the same range in colors as the Bt horizon and are mottled in shades of brown, gray, or red. Texture is silt loam or silty clay loam in the Btx horizon, and it is silt loam, loam, silty clay loam, and clay loam in the 2Btx horizon. Content of total sand in the 2Btx horizon ranges from 20 to 60 percent. Content of clay in the fragipan ranges from 18 to 35 percent.

The 2B't horizon has the same range in colors and texture as the 2Btx horizon. Brittle bodies range from none to common and can make up from 10 to 40 percent of the volume of the matrix.

Tunica Series

The Tunica series consists of poorly drained, very slowly permeable soils that formed in clayey alluvium over loamy alluvium. These soils are on the flood plain of the Mississippi River. Some areas of these soils are protected from flooding by earthen levees; other areas flood frequently. Slopes range from 1 to 3 percent. Soils of the Tunica series are clayey over loamy, montmorillonitic, nonacid, thermic Vertic Haplaquepts.

Tunica soils commonly are near Commerce, Convent, Fausse, Robinsonville, and Sharkey soils. Commerce, Convent, and Robinsonville soils are in higher positions than the Tunica soils. Commerce soils are fine-silty, Convent soils are coarse-silty, and Robinsonville soils are coarse-loamy. Fausse and Sharkey soils are in lower positions than the Tunica soils and have a very fine-textured particle-size control section.

Typical pedon of Tunica clay, in an area of Tunica and Sharkey soils, undulating, frequently flooded; about 5.5 miles east of St. Francisville, 1,500 feet north of Lake Platt; sec. 23, T. 3 S., R. 4 W., West Feliciana Parish; USGS St. Francisville topographic quadrangle; latitude 30 degrees 43 minutes 7 seconds N.; longitude 91 degrees 28 minutes 58 seconds W.

Ap—0 to 11 inches; dark grayish brown (10YR 4/2) clay; weak fine subangular blocky structure; firm; strongly acid; clear wavy boundary.

Bg1—11 to 23 inches; gray (10YR 5/1) clay; common medium prominent yellowish brown (10YR 5/6) mottles;

weak medium subangular blocky structure; firm; moderately acid; clear wavy boundary.

Bg2—23 to 33 inches; grayish brown (10YR 5/2) silty clay; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; few slickensides; slightly acid; gradual wavy boundary.

2Cg—33 to 60 inches; light brownish gray (10YR 6/2) loam, common medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; neutral.

The solum thickness and depth to loamy layers range from 20 to 36 inches.

The Ap horizon has value of 3 or 4 and chroma of 1 or 2. It is 5 to 12 inches thick. Reaction ranges from strongly acid to slightly alkaline.

The Bg horizon has hue of 10YR to 5Y, value of 4 or 5, and chroma of 1 or 2; or it is neutral with value of 4 or 5. Texture is clay or silty clay. Reaction ranges from moderately acid to slightly alkaline.

The 2Cg horizon has hue of 10YR or 5Y, value of 4 to 6, and chroma of 1 or 2; or it is neutral with value of 4 to 6. Texture is fine sandy loam, loam, silty clay loam, or silt loam. Reaction ranges from moderately acid to moderately alkaline.

Weyanoke Series

The Weyanoke series consists of well drained, moderately permeable soils that formed in loamy sediments. These soils are on stream terraces and are subject to rare flooding. Slopes range from 1 to 3 percent. Soils of the Weyanoke series are coarse-silty, mixed, thermic Dystric Eutrochrepts.

Weyanoke soils commonly are near Bigbee, Feliciana, Loring, and Morganfield soils. Bigbee soils are on flood plains and are sandy throughout the profile. Feliciana and Loring soils are on uplands and are fine-silty. Loring soils have a fragipan. Morganfield soils are in lower positions than the Weyanoke soils and do not have a cambic horizon.

Typical pedon of Weyanoke silt, 1 to 3 percent slopes; about 1.7 miles west of St. Francisville, 600 feet east of Bayou Sara, 100 feet south of parish road; Spanish Land Grant sec. 70, T. 3 S., R. 3 W., West Feliciana Parish; USGS St. Francisville topographic quadrangle; latitude 30 degrees 46 minutes 39 seconds N., longitude 91 degrees 25 minutes 6 seconds W.

Ap—0 to 3 inches; brown (10YR 5/3) silt; weak fine granular structure; friable; many fine roots; neutral; clear smooth boundary.

Bw1—3 to 12 inches; yellowish brown (10YR 5/4) silt; weak medium subangular blocky structure; friable; many fine roots; few fine pores; few worm casts; neutral; clear wavy boundary.

Bw2—12 to 27 inches; dark yellowish brown (10YR 4/4) silt; weak medium subangular blocky structure; friable; few fine roots; few fine pores; few worm casts; neutral; clear wavy boundary.

C—27 to 60 inches; yellowish brown (10YR 5/4) silt loam; common medium faint pale brown (10YR 6/3) mottles; massive; friable; common bedding planes; neutral.

The thickness of the solum ranges from 18 to 48 inches. Content of total sand in the particle-size control section ranges from 15 to 40 percent. Less than 15 percent of the sand in the family particle-size control section is fine sand or coarser. Reaction ranges from moderately acid to slightly alkaline throughout the solum.

The Ap horizon has value of 3 to 5 and chroma of 1 to 4. Where value is 3, the Ap horizon is less than 6 inches thick.

The Bw horizon has value of 4 or 5 and chroma of 3, 4, 6, or 8. Some pedons have mottles with chroma of 2 or less below 24 inches from the surface. Texture is silt, silt loam, or very fine sandy loam.

Some pedons have a BC horizon. Where present, it has colors similar to those of the Bw horizon. Mottles are in shades of gray or brown. Texture is silt loam, loam, or very fine sandy loam.

The C horizon has colors similar to those of the Bw horizon. Mottles are in shades of gray or brown. Bedding planes range from few to many. Texture is silt loam, loam, fine sandy loam, or very fine sandy loam.

fine pores; common yellowish-red to black Fe-Mn segregations; very strongly acid; gradual, smooth boundary.

Bx3&A'2x—37 to 52 inches, yellowish-brown (10YR 5/4) medium silt loam with common, fine, distinct, grayish-brown (10YR 5/2), light-gray (10YR 7/2), and yellowish-brown (10YR 5/6) mottles; strong, medium and coarse, prismatic structure; firm; vertical and horizontal veins of light brownish-gray (10YR 6/2) silt between prisms; many fine pores; common, soft, brown and black Fe-Mn segregations; strongly acid; diffuse, wavy boundary.

B'x—52 to 64 inches, yellowish-brown (10YR 5/6) medium silt loam; weak, medium and coarse, prismatic structure; firm; thin coatings of light brownish-gray (10YR 6/2) silt between prisms; many fine pores; strongly acid.

The texture of the A horizon ranges from silt to silt loam. The Ap horizon is brown to grayish brown. The A2 horizon ranges from predominantly gray mottled with yellowish brown to predominantly brown mottled with gray. The thickness of the Bt horizon ranges from 6 to 15 inches. The B2t horizon is yellowish brown to dark yellowish brown, and in some places the uppermost 4 to 6 inches is free of mottles. The Bx&A'2x horizon is 12 inches to several feet thick and ranges from brown to yellowish brown in color and has vertical streaks of pale-brown to grayish-brown or gray silt loam. The texture of this horizon ranges from silt loam to silty clay loam. The reaction is slightly acid to very strongly acid in the surface layer and strongly acid to very strongly acid in the subsoil and fragipan.

Olivier silt loam, 0 to 1 percent slopes (OIA).—This soil is scattered throughout the parish.

The surface layer is grayish-brown, friable silt loam about 9 inches thick. The subsoil, to a depth of 22 inches, is yellowish-brown, friable silty clay loam or heavy silt loam mottled with grayish brown. Beneath this layer is a firm, somewhat brittle fragipan of yellowish-brown silty clay loam or silt loam that is mottled with grayish brown and has thick tongues of gray silt or silt loam. This fragipan extends to a depth of 50 inches or more.

Included in the areas mapped are areas that have a loam or sandy loam texture below a depth of 36 inches, and small areas that have a subsoil of heavy silty clay loam with common red and yellowish-red mottles and continuous gray coatings on the peds.

This soil is fairly easy to keep in good tilth. The content of nitrogen, phosphorus, and potassium is low. The reaction ranges from slightly acid to very strongly acid in the surface layer and from strongly acid to very strongly acid in the subsoil, including the fragipan. Lime generally is needed.

Runoff is slow, and permeability also is slow. The supply of moisture is adequate for cultivated crops and pasture plants, except during dry periods that sometimes occur in summer and fall. Water stands in some places for a few days after heavy rains. Some areas need to be drained if used for cultivated crops.

About 50 percent of the acreage is in forest consisting of mixed hardwoods and pines, 25 percent has been developed for urban use, 20 percent is used for pasture and hay, and a small acreage is in pecan orchards. Only a small acreage is cultivated.

This soil is suited to most of the crops commonly grown in the parish. (Capability unit IIw-2; woodland suitability group 2; wildlife suitability group 2)

Olivier silt loam, 1 to 3 percent slopes (OIB).—This soil occurs throughout the parish.

The surface layer is grayish-brown friable silt loam about 9 inches thick. The subsoil, to a depth of 22 inches, is yellowish-brown, friable silty clay loam or heavy silt loam mottled with gray. Beneath this layer is a firm, somewh brittle fragipan of yellowish-brown silt loam or silty cl loam that has thick tongues of gray silt and is mottled wi grayish brown.

Included in the areas mapped are small areas that ha a subsoil of heavy silty clay loam with prominent red a yellowish-red mottles and continuous gray coatings on t peds. Areas included in the northeastern part of the pari have sandy material below a depth of about 36 inches. Al included are small areas of Calhoun, Deerford, Prov dence, and Loring soils, and a few areas that have a slo range of 3 to 5 percent.

This Olivier soil is low in nitrogen, phosphorus, a potassium. The reaction is medium to strongly acid in t surface layer and strongly acid to very strongly acid in t subsoil, including the fragipan. Lime generally is neede

Runoff is medium, and permeability is slow. The supp of moisture is adequate for cultivated crops and pastu plants, except during dry periods that sometimes occur summer and fall. Erosion control is needed if clean-till crops are grown.

About 42 percent of the acreage is in forest consisting mixed hardwoods and pines, 37 percent is used for pastu and hay, and 20 percent has been developed for urban u Less than 1 percent is cultivated.

This soil is suited to most of the crops commonly grov in the parish. (Capability unit IIw-3; woodland su ability group 2; wildlife suitability group 3)

Providence Series

The Providence series consists of moderately w drained, slowly permeable, acid soils that formed in loe like material over sandier material. These soils have a su face layer of brown, grayish-brown, or dark grayish-brov silt loam and a subsoil of brown to yellowish-red silty cl loam. The lower part of the subsoil is a somewhat britt fragipan of brownish-yellow silt loam, loam, or very fi sandy loam with gray mottles. The material becomes mo sandy as the depth increases.

Providence soils are gently sloping and occur main along the northeastern border of the parish. They co monly adjoin Loring and Olivier soils. Providence so are similar to Loring soils in many respects but have higher sand content in the lower part of the fragipa Providence soils are better drained than Olivier soils a higher in sand content.

Most areas of Providence soils are used for pasture. On a small acreage is used for cultivated crops, and the r is in forest consisting of pines and a few hardwoods.

Representative profile of Providence silt loam, in a pa ture located 0.7 mile northeast of the Baywood Churc SW¼SW¼ sec. 8, T. 4 S., R. 3 E.

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loa moderate, medium and fine, granular structure; f able; many fine pores; common fragments of charco strongly acid; abrupt, smooth boundary.

B1—7 to 11 inches, yellowish-brown (10YR 5/6) silt loa massive (structureless) to weak, medium, subangul blocky structure; friable; common fine and coa pores; common dark grayish-brown worm casts; ve strongly acid; clear, smooth boundary.

B2t—11 to 22 inches, strong-brown (7.5YR 5/6) silty clay loa moderate, medium, subangular blocky structure; f able; many fine pores; thin, patchy clay films in lar pores and root channels; common vertical veins

material. The lower part of the subsoil is alka-
e surface layer is ... grayish-brown silt loam
nottled with gray in ... lower part. The subsoil
olive-brown, yellowish-brown, or grayish-brown
y loam mottled with shades of brown, and the
ing material is yellowish-brown silt loam. The
orizons of these soils are moderate to high in con-
sodium.

ord soils are mainly in the northern part of the
und in a broad belt that extends from northwest
east through the interior of the parish. The slope
up to 3 percent. These soils commonly adjoin
Verdun, and Fred soils. Deerford soils are similar
un soils in many respects, but they lack the co-
structure, and only their lower horizons are high
um. Deerford soils lack the fragipan that is char-
ic of Olivier soils. They are more poorly drained
ed soils and have a higher content of sodium.

areas of Deerford soils are in mixed hardwood for-
ne areas have been developed for urban use, some
d primarily for pasture, and a small acreage is
ed.

esentative profile of Deerford silt loam, in a pas-
ated 0.8 mile north-northwest of the intersection of
lroad and the main highway in Zachary, in the
stern part of sec. 83, T. 4 S., R. 1 W. Physical and
l test data (sample No. S62La-17-44) are shown
e 8, and clay mineral data are shown in table 9.

-0 to 3 inches, brown (10YR 5/3) silt loam; moderate, fine, granular structure; friable; many fine pores; strongly acid; abrupt, smooth boundary.

-3 to 6 inches, brown (10YR 5/3) silt loam with common, fine and medium, faint, grayish-brown (10YR 5/2) and light brownish-gray (10YR 6/2) mottles; weak, thin or medium, platy structure; firm; many fine pores; common, fine, brown concretions; strongly acid; abrupt, smooth boundary.

B—6 to 10 inches, brown (10YR 5/3) silt loam with common, fine, faint, light brownish-gray (10YR 6/2) mottles; massive; firm; many pores; common worm casts of light brownish gray; many brown and black concretions, concentrated at lower boundary; 10 to 20 percent irregular blocks of mottled, dark yellowish-brown and brown silty clay loam; strongly acid; gradual, wavy boundary.

... mon, soft and hard, black and brown concretions; moderately alkaline.

The Ap horizon ranges from brown to grayish brown. The A2 horizon ranges from brown mottled with gray to predominantly gray in color and from 3 to 10 inches in thickness. Tongues of the lower A2 horizon extend into the uppermost 4 to 8 inches of the B2t horizon. The B2t horizon ranges from brown to yellowish brown in color and from 6 to 24 inches in thickness. The clay films, which range from few to almost continuous, are dark grayish brown to very dark gray. The texture of the B horizon ranges from silty clay loam to heavy silt loam. As much as 5 percent of the B and C horizons is mottled with gray or brownish gray. A few lime concretions are present in places at a depth of 18 to 30 inches.

Deerford silt loam (De).—Most areas of this soil are in a broad belt that extends from the northwest through the interior of the parish. They are mainly level or nearly level, but the slope ranges up to 3 percent.

The surface layer is a brown or grayish-brown, friable silt loam that is mottled with gray in the lower part. The subsoil is light olive-brown or yellowish-brown, firm silty clay loam that is mottled with shades of brown and has dark-colored clay films on the peds. Tongues of gray silt loam extend into the subsoil to a depth of about 14 inches. The underlying material is yellowish-brown, friable silt loam. The lower part of the subsoil has a high content of sodium.

Included in the areas mapped are small areas of Olivier, Verdun, and Fred soils. Also included are small areas that have a darker colored surface layer and mottles of reddish brown in the upper subsoil, and areas in which the subsoil does not have clay films.

This soil is fairly easy to work but generally is in poor tilth. It is low in nitrogen, phosphorus, and potassium. The reaction is medium acid to strongly acid to a depth of about 18 inches and mildly alkaline to moderately alkaline below that depth. Sodium in the lower subsoil somewhat restricts the root zone.

Runoff is slow in the level areas and medium on slopes of 1 to 3 percent. The supply of moisture is adequate for cultivated crops and pasture plants, except during the drier periods in summer and fall. Water stands in some places for a few days after heavy rains. Drainage is needed in some areas that are used for cultivated crops.

The Olivier soil has a grayish-brown
brown, friable surface layer. The subsoi
brown, friable silty clay loam that is mott
of brown. The lower part is a fragipan of y
firm silt loam or silty clay loam with b
mottles. The reaction is slightly acid to ve
in the surface layer and strongly acid t
acid in the subsoil.

Included in the areas mapped are smal
and Verdun soils.

These Deerford and Olivier soils are l
phosphorus, and potassium. Runoff is slo
and permeability is slow to very slow. The
ture generally is adequate for cultivated c
plants, except during the drier periods in s
Water stands in some places for a few d
rains. Drainage is needed in some areas t
cultivated crops.

About 42 percent of the acreage has bee
urban use, 28 percent is used for pasture
percent is in forest. Only small areas are c
These soils are fairly well suited to most
grown in the parish. (Capability unit I
suitability group 5 for the Deerford soi
Olivier soil; both soils are in wildlife suit

Deerford-Olivier silt loams, 1 to 3
(DfB).—These soils occur in an intricate
slopes, mostly in the southern and southeas
parish. About 60 percent of the acreage
loam, and 30 percent is Olivier silt loam.

The Deerford soil has a brown or grayis
surface layer that is mottled with gray i
The subsoil is yellowish-brown or light o
silty clay loam mottled with shades of
dark-colored clay films and tongues of gr
underlying material is yellowish-brown,
The lower part of the subsoil has a high c
and generally remains dry even in wet p
tion is medium acid to very strongly acid
18 inches and neutral to moderately alk
depth.

About 60 percent of the acreage is in mixed hardwood forest, 36 percent is used for pasture and hay, and a few areas have been developed for urban use. Only a few small fields are cultivated.

This soil is fairly well suited to most crops commonly grown in the parish. (Capability unit IIw-4; woodland suitability group 5; wildlife suitability group 2)

Deerford-Olivier silt loams, 0 to 1 percent slopes (DfA).—These soils occur in an intricate pattern, mostly in a broad belt that extends from northwest to southeast through the interior of the parish. About 60 percent of the acreage is Deerford silt loam, and about 30 percent is Olivier silt loam.

The Deerford soil has a brown or grayish-brown, friable surface layer that is mottled with gray in the lower part. The subsoil is grayish-brown, light olive-brown, or yellowish-brown, firm silty clay loam mottled with shades of brown and with dark-gray clay films and tongues of gray silt or silt loam. The lower part of the subsoil has a high content of sodium. The reaction is medium acid to very strongly acid to a depth of about 18 inches and neutral to moderately alkaline below that depth.

The Olivier soil has a grayish-brown and yellowish-brown, friable surface layer. The subsoil is yellowish-brown, friable silty clay loam that is mottled with shades of brown. The lower part is a fragipan of yellowish-brown, firm silt loam or silty clay loam with brown and gray mottles. The reaction is slightly acid to very strongly acid in the surface layer and strongly acid to very strongly acid in the subsoil.

Included in the areas mapped are small areas of Fred and Verdun soils.

These Deerford and Olivier soils are low in nitrogen, phosphorus, and potassium. Runoff is slow in most areas, and permeability is slow to very slow. The supply of moisture generally is adequate for cultivated crops and pasture plants, except during the drier periods in summer and fall. Water stands in some places for a few days after heavy rains. Drainage is needed in some areas that are used for cultivated crops.

About 42 percent of the acreage has been developed for urban use, 28 percent is used for pasture and hay, and 26 percent is in forest. Only small areas are cultivated.

These soils are fairly well suited to most crops commonly grown in the parish. (Capability unit IIw-4; woodland suitability group 5 for the Deerford soil and 2 for the Olivier soil; both soils are in wildlife suitability group 2)

Deerford-Olivier silt loams, 1 to 3 percent slopes (DfB).—These soils occur in an intricate pattern on short slopes, mostly in the southern and southeastern parts of the parish. About 60 percent of the acreage is Deerford silt loam, and 30 percent is Olivier silt loam.

The Deerford soil has a brown or grayish-brown, friable surface layer that is mottled with gray in the lower part. The subsoil is yellowish-brown or light olive-brown, firm silty clay loam mottled with shades of brown and with dark-colored clay films and tongues of gray silt loam. The underlying material is yellowish-brown, friable silt loam. The lower part of the subsoil has a high content of sodium and generally remains dry even in wet periods. The reaction is medium acid to very strongly acid in the uppermost 18 inches and neutral to moderately alkaline below that depth.

The Olivier soil has a grayish-brown and yellowish-brown, friable surface layer. The subsoil is yellowish-brown, friable silty clay loam mottled with brown. The lower part is a fragipan of yellowish-brown, firm silt loam or silty clay loam mottled with brown and gray. The reaction is slightly acid to very strongly acid in the surface layer and strongly acid to very strongly acid in the subsoil and fragipan.

These Deerford and Olivier soils are low in nitrogen, phosphorus, and potassium. Runoff is medium, and permeability is slow to very slow. The supply of moisture generally is adequate for cultivated crops and pasture plants, except during dry periods in summer and fall. Erosion control is needed if clean-tilled crops are grown.

Most of the acreage is used for pasture and hay. A small part is in mixed hardwood forest.

These soils are fairly well suited to most of the crops commonly grown in the parish. (Capability unit IIw-3; woodland suitability group 5 for the Deerford soil and 2 for the Olivier soil; both soils are in wildlife suitability group 3)

Deerford-Verdun silt loams (Dn).—These soils occur in an intricate pattern throughout the northeastern two-thirds of the parish. About 60 percent of the acreage is Deerford silt loam, and 30 percent is Verdun silt loam.

The Deerford soil has a brown or grayish-brown, friable surface layer that is mottled with gray in the lower part. The subsoil is grayish-brown or yellowish-brown, firm silty clay loam mottled with shades of brown and with dark-gray clay films and tongues of gray silt loam. The underlying material is yellowish-brown, friable silt loam. The lower part of the subsoil has a high content of sodium. The reaction is medium acid to very strongly acid to a depth of about 18 inches and neutral to alkaline below that depth.

The Verdun soil has a grayish-brown, friable surface layer mottled with gray and brown in the lower part. The subsoil is yellowish-brown, firm silty clay loam mottled with shades of brown and, in the lower part, gray. There are dark-colored clay coatings and gray silt coatings. The underlying material is yellowish-brown, friable silt loam that is mottled with gray and brown and normally contains a few lime concretions. The subsoil has a high content of sodium and generally remains dry even in wet periods. The reaction is strongly acid to moderately alkaline in the surface layer and slightly acid to moderately alkaline in the subsoil.

Included in the areas mapped are small areas of Fred, Essen, and Olivier soils.

The soils of this complex are low in nitrogen, phosphorus, and potassium. Runoff is slow, and permeability is slow to very slow. A few areas are subject to occasional floods of short duration. During the drier periods in summer and fall, the supply of moisture generally is not adequate for cultivated crops and pasture plants. Drainage is needed in some areas that are used for cultivated crops.

About 48 percent of the acreage is in pasture, 30 percent has been developed for urban use, and 21 percent is in mixed hardwood forest. Small areas are used for garden crops and truck crops.

These soils are suitable for shallow-rooted plants that grow in cool seasons when the supply of moisture is adequate. They are not well suited to most cultivated crops, because the root zone, especially that of the Verdun soil,

Waverly-Falaya silt loams, overflow (Wf).—These soils are mainly on flats or in depressions on the flood plain of most of the streams in the parish except the Mississippi River. They are subject to frequent floods. About 60 percent of the acreage consists of Waverly silt loam, which is poorly drained, and 30 percent consists of Falaya silt loam, which is somewhat poorly drained.

The Waverly soil has a brown or grayish-brown surface layer 2 to 6 inches thick. The underlying material is gray silt loam with brown mottles.

The Falaya soil has a brown or grayish-brown surface layer about 14 inches thick. The underlying material is gray silt loam with brown mottles.

Included in the areas mapped are small areas of Zachary and Calhoun soils.

The soils of this complex are strongly acid to very strongly acid. Runoff is slow. Permeability is moderate in the Falaya soil and moderately slow in the Waverly soil. The available water capacity is high.

Most of the acreage is in mixed hardwood forest. Only about 7 percent is used for pasture.

These soils are suited to most of the pasture plants commonly grown in the parish, unless flooding is severe. They are not suited to cultivated crops, because they are likely to be flooded. (Capability unit Vw-1; woodland suitability group 4; wildlife suitability group 4)

Zachary Series

The Zachary series consists of poorly drained, slowly permeable, acid soils that formed in silty alluvium. These soils have a thick surface layer of grayish-brown to gray silt loam mottled with brown. The subsoil is gray or light olive-gray silty clay loam mottled with brown.

Zachary soils occur on broad flats and in depressions throughout the parish. They commonly adjoin Olivier, Loring, Deerford, Verdun, Fred, and Calhoun soils. Zachary soils are similar to Calhoun soils but have a thicker surface layer. They are more poorly drained than Olivier, Loring, Deerford, Verdun, and Fred soils.

Most areas of Zachary soils are in mixed hardwood forest. Most areas are subject to overflow and have little potential as cropland, but a small acreage is used for pasture.

Representative profile of Zachary silt loam, in a forested area located in the NE¼ sec. 73, T. 5 S., R. 1 W.

A1—0 to 2 inches, grayish-brown (10YR 5/2) silt loam; moderate, medium, granular structure; friable; abrupt, smooth boundary.

A21g—2 to 7 inches, light brownish-gray (10YR 6/2) silt loam; weak, medium, granular structure; friable; many dark-brown and yellowish-brown coatings in root channels; very strongly acid; gradual, smooth boundary.

A22g—7 to 18 inches, gray (10YR 6/1) silt loam with many, fine, distinct, light yellowish-brown (10YR 6/4) and yellowish-brown (10YR 5/4–5/8) mottles; massive; friable; many fine pores; dark-brown and dark yellowish-brown coatings in root channels; very strongly acid; gradual, smooth boundary.

A23g—18 to 24 inches, gray (10YR 6/1) silt loam with many, fine, distinct mottles and root-channel coatings of yellowish brown (10YR 5/6) and dark brown (7.5YR 4/4); massive; friable; many pores; strongly acid; abrupt, smooth boundary.

A24g—24 to 28 inches, gray (10YR 6/1) silt loam; moderate, medium, platy structure; friable; few yellowish-brown and dark-brown coatings in root channels; very strongly acid; abrupt, irregular boundary.

B21tg—28 to 34 inches, gray (10YR 6/1) silty clay loam with many, fine, distinct mottles and root-channel coatings of pale brown (10YR 6/3), yellowish brown (10YR 5/6), and dark brown (7.5YR 4/4); moderate, medium, prismatic structure; slightly plastic; almost continuous, thin skins of gray clay on vertical and horizontal faces of peds; few thin tongues of gray silt loam in uppermost few inches; few fine pores; strongly acid; diffuse, irregular boundary.

B22tg—34 to 43 inches, light olive-gray (5Y 6/2) silty clay loam with few mottles or root-channel coatings of yellowish brown (10YR 5/4) and dark brown (7.5YR 4/4); moderate, medium, prismatic structure; slightly plastic; almost continuous, thin coatings of gray material on prisms; gray silt loam in few krotovinas or vertical veins; very strongly acid; gradual, smooth boundary.

B23tg—43 to 50 inches, light olive-gray (5Y 6/2) silty clay loam with few, fine, distinct, yellowish-brown (10YR 5/4) and pale-brown (10YR 6/3) mottles; moderate, medium, prismatic structure; slightly plastic; thin, patchy films of gray and dark-gray clay and thin coatings of gray silt; few vertical veins of gray and dark-gray silt loam that are coarsely porous; few fine pores; few brown and black concretions; strongly acid at a depth of 50 inches.

B3tg—50 to 60 inches, light olive-gray (5Y 6/2) silty clay loam with few, fine, distinct, yellowish-brown (10YR 5/4) and pale-brown (10YR 6/3) mottles; few vertical veins of gray and dark-gray silt loam; slightly plastic; strongly acid.

The A1 horizon ranges from 1 to 4 inches in thickness and from grayish brown to very dark grayish brown in color. The A2 horizon is 24 to 30 inches thick. It is free of mottles in some places and is as much as 10 percent mottled in others. The Bt horizon commonly is gray to light olive gray in color and has a few brown and olive mottles. The reaction is strongly acid to very strongly acid throughout.

Zachary silt loam (Za).—This soil is on flats, in depressions, and along drainageways throughout the parish. It is flooded frequently.

The surface layer is grayish-brown to gray, friable silt loam 24 to 30 inches thick. The subsoil is gray or light olive-gray silty clay loam 1 to 3 feet thick. Both these layers are mottled with brown.

Included in the areas mapped are small areas of Frost, Calhoun, Waverly, Fountain, and Bonn soils.

This Zachary soil is strongly acid to very strongly acid. Runoff is very slow, and permeability is slow. Most of the acreage is in mixed hardwood forest, but about 15 percent is in pasture.

This soil is suited to most of the pasture plants commonly grown in the parish, unless flooding is severe. It is not suited to cultivated crops. (Capability unit Vw-1; woodland suitability group 4; wildlife suitability group 4)

Use and Management of the Soils

This section discusses management of the soils of East Baton Rouge Parish as cropland, as pasture, as woodland, and as wildlife habitat, and the uses of the soils for engineering and other nonfarm purposes.

General Principles of Management for Crops and Pasture

General principles of soil management widely applicable in East Baton Rouge Parish are discussed in the following paragraphs. Specific recommendations cannot be give n odium and generally remains dry even in wet er. The reaction is strongly acid to moderately alka-ne in the surface layer and neutral to moderately alka-ne in the subsoil and substratum.

Included in the areas mapped are small areas of Deer-ord, Fountain, Bonn, Frost, and Calhoun soils.

Essen and Lafe silt loams generally are only fair to poor tilth and are low in nitrogen, phosphorus, and potas-ium. Preparing a seedbed is somewhat difficult.

Runoff is slow, and permeability is moderately slow to ery slow. A few areas are subject to occasional floods of hort duration. During the drier periods in summer and all, the moisture supply of the Lafe soil is not adequate or cultivated crops and pasture plants. Drainage is needed n some places if these crops are grown.

Most of the acreage is used for pasture and hay, but bout 40 percent has been developed for urban use.

Because both soils are somewhat poorly drained and the afe soil is high in sodium content, this mapping unit not well suited to cultivated crops. (Capability unit IIs-1; woodland suitability group 5; wildlife suitability roup 2)

'alaya Series

The Falaya series consists of somewhat poorly drained, cid soils that formed in silty alluvium. These soils have veakly developed horizons, all of silt loam. They are rownish in the upper part and light brownish gray and gray in the lower part.

F soils are on the flood plains of streams and drain-ge. They commonly adjoin Waverly and Cascilla oils, which they resemble in many respects. Falaya soils re better drained than Waverly soils and are more poorly rained than Cascilla soils.

Falaya soils are subject to annual floods and are not used or cultivated crops. Most areas are in forest consisting of nixed hardwoods and a few pines. A small acreage is used or pasture.

In this parish Falaya soils are mapped only as part of complex with Waverly soils. This complex is described nder the Waverly series.

Representative profile of Falaya silt loam, in a wooded rea located about 4 miles north-northeast of Fred and 700 eet north of the Strangers Home Church, NE¼ sec. 15, . 4 S., R. 1 E.

A11—0 to 1 inch, dark-brown (10YR 4/3) silt loam with few dark grayish-brown mottles; moderate, fine and medium, granular structure; friable; medium acid; abrupt, smooth boundary.

A12—1 inch to 4 inches, brown (10YR 5/3) silt loam with dark yellowish-brown (10YR 4/4) and dark grayish-brown (10YR 4/2) mottles; moderate, medium, granular structure; friable; strongly acid; gradual, smooth boundary.

A13—4 to 12 inches, pale-brown (10YR 6/3) silt loam with few brown (10YR 5/3) mottles; massive; friable; very strongly acid; gradual, wavy boundary.

C1—12 to 20 inches, light brownish-gray (2.5Y 6/2) silt loam with common, fine, faint, pale-brown (10YR 6/3) mottles and few dark yellowish-brown mottles; weak, coarse, subangular blocky structure; friable; few, soft, black and brown concretions; very strongly acid; gradual, wavy boundary.

20 to 42 inches, light brownish-gray (2.5Y 6/2) silt loam with common, fine, distinct, dark-brown (7.5YR 3/2) mottles; massive (structureless) to weak, medium, subangular blocky structure; friable; few, soft, black and brown concretions; very strongly acid; gradual, smooth boundary.

C3—42 to 48 inches, light-gray (10YR 7/2) silt loam with coarse, brown (10YR 5/3) mottles; massive; friable; few brown and black concretions; very strongly acid.

The A horizon ranges from brown to dark grayish brown or dark brown in color and from 8 to 14 inches in thickness. The C horizon ranges from gray to light brownish gray. From 2 percent to 15 percent of this horizon is mottled with brown.

Fountain Series

The Fountain series consists of poorly drained, moderately slowly permeable, alkaline soils that formed in loess-like material. These soils have a surface layer of grayish-brown or brown silt loam and a subsoil of gray silty clay loam or heavy silt loam mottled with brown. The underlying material is yellowish-brown silt loam mottled with gray and brown.

Fountain soils are nearly level and occur mainly in the eastern half of the parish. They commonly adjoin Calhoun and Bonn soils. Fountain soils are similar to Calhoun soils but are not acid. They lack the high sodium content of Bonn soils.

Most areas of Fountain soils are in mixed hardwood forest. Some of the acreage has been developed for urban use, some is used for pasture, and a very small part is used for cultivated crops.

Representative profile of Fountain silt loam, in a cultivated field located 0.7 mile west-southwest of the intersection of Perkins Road and Essen Lane, sec. 42, T. 7 S., R. 1 E. Physical and chemical test data (sample No. S62La-17-42) are shown in table 8, and clay mineral data are shown in table 9.

Ap1—0 to 6 inches, grayish-brown (2.5Y 5/2) silt loam; strong, fine, granular structure; friable; many fine pores; neutral; abrupt, smooth boundary.

Ap2—6 to 10 inches, grayish-brown (10YR 5/2) and light brownish-gray (10YR 6/2) silt loam; strong, medium, platy structure; friable; fine pores; neutral; abrupt, smooth boundary.

B&A—10 to 20 inches, light brownish-gray (10YR 6/2) silty clay loam with many, coarse, faint, grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/4) mottles; massive; friable; many fine pores; vertical tongues of gray silt loam; few clay films; few, soft, brown and black concretions; mildly alkaline; clear, smooth boundary.

B2tg—20 to 45 inches, gray (10YR 5/1) silty clay loam with common, medium, faint, light brownish-gray (10YR 6/2) mottles and many, coarse, prominent, yellowish-brown (10YR 5/8) mottles; medium prismatic structure breaking to moderate, medium, subangular blocky; friable to firm; many, thin, light brownish-gray clay films cover prism faces; many fine pores; few krotovinas of dark-gray silt loam; few carbonate concretions, ½ inch to 2 inches in diameter, between depths of 30 and 45 inches; mildly alkaline; gradual, wavy boundary.

C1—45 to 51 inches, yellowish-brown (10YR 5/6) silt loam with many, medium, distinct, light brownish-gray (10YR 6/2) mottles; massive (structureless) to weak, medium, prismatic structure; friable; many fine pores; few brown and black concretions; mildly alkaline; clear, smooth boundary.

C2—51 to 75 inches, light brownish-gray (10YR 6/2) silt loam with common, fine, faint, gray (10YR 5/1) and grayish-brown (10YR 5/2) mottles and few, coarse, distinct, yellowish-brown (10YR 5/6) mottles; massive; friable; mildly alkaline.

The Ap1 horizon ranges from dark grayish brown to grayish brown in color, and the Ap2, from grayish brown to gray.

The B and C horizons are dominantly gray, but 2 to 20 percent of the material is mottled with brown. The B horizon ranges from silty clay loam to heavy silt loam in texture. The reaction is strongly acid to moderately alkaline to a depth of 18 inches and mildly alkaline to moderately alkaline below that depth. Lime concretions do not occur in all areas.

Fountain silt loam (Fn).—This level or nearly level soil is in small areas on the Perkins Road Farm of the Louisiana Agricultural Experiment Station.

The surface layer is grayish-brown, friable silt loam about 10 inches thick. The subsoil is gray, friable silty clay loam mottled with olive or brown.

Good tilth is somewhat difficult to maintain because the surface tends to crust. The content of nitrogen, phosphorus, and potassium is low. The reaction is strongly acid to mildly alkaline in the surface layer and neutral to moderately alkaline in the subsoil.

This soil generally is wet in winter and spring and somewhat dry in summer and fall. Runoff is slow, and permeability is moderately slow. A few areas are subject to occasional floods. Drainage is needed if cultivated crops and pasture plants are grown.

Most of the locally grown crops can be grown on this soil. (Capability unit IIIw-3; woodland suitability group 5; wildlife suitability group 1)

Fountain and Bonn silt loams (Fo).—These level or nearly level soils are in many small areas and in depressions in the central part of the parish. Some delineations contain Fountain silt loam, some contain Bonn silt loam, and some contain both soils.

The Fountain soil has a grayish-brown, friable to firm surface layer about 6 to 10 inches thick. The subsoil is gray, friable silty clay loam mottled with brown.

The Bonn soil has a grayish-brown or gray, friable to firm surface layer. The subsoil, to a depth of 36 inches, is gray, firm to friable silt loam or silty clay loam with dark-colored clay films. The underlying material is gray, friable silt loam. The subsoil has a high sodium content and generally remains dry even in wet periods.

Included in the areas mapped are small areas of Calhoun and Frost soils.

Both the Fountain soil and the Bonn soil in this mapping unit are strongly acid to moderately alkaline in the surface layer and neutral to moderately alkaline below a depth of 18 inches.

These soils are low in nitrogen, phosphorus, and potassium. Runoff is slow, and permeability also is slow. These soils generally are wet in winter and spring. The Bonn soil does not hold enough moisture for cultivated crops and pasture plants during the drier periods in summer and fall. Also, it is subject to occasional floods.

Most of the acreage is used for pasture and hay, but about 25 percent is in mixed hardwood forest, and 14 percent has been developed for urban use.

These soils are not well suited to cultivated crops, because they are wet. The root zone of the Bonn soil is restricted by the sodium, and the surface tends to crust. (Capability unit IIIw-3; woodland suitability group 5; wildlife suitability group 1)

Fred Series

The Fred series consists of moderately well drained, moderately slowly permeable, slightly acid to alkaline soils that formed in loesslike material. These soils have a surface layer of dark grayish-brown to brown silt loam w brown and gray mottles in the lower part. The subso dark yellowish-brown and brown silty clay loam or he silt loam. The underlying material is mottled yellow brown, grayish-brown, or olive-brown silt loam.

Fred soils are nearly level and occur in small areas in central part of the parish. They commonly adjoin D ford and Verdun soils, both of which have horizons h in sodium content. Fred soils are similar to Fountain a Essen soils in many respects but are better drained.

Most areas of Fred soils have been developed for url use. The remaining acreage is mostly in pasture or mi hardwood forest. A small acreage is cultivated.

Representative profile of Fred silt loam, in a cultiva field located in the central part of sec. 41, T. 7 S., R. 1 Physical and chemical test data (sample No. S62La-17-4 are shown in table 8, and clay mineral data are shown table 9.

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loa moderate, fine and medium, granular structure; co mon fine pores; slightly acid; clear, smooth bounda

A2—6 to 9 inches, brown (10YR 5/3) silt loam with comm fine and medium, faint, grayish-brown (10YR 5/ pale-brown (10YR 6/3), and gray (10YR 6/1) m tles; strong, medium and thick, platy structure; fir few fine pores; few, small, black and brown conc tions; slightly acid; clear, wavy boundary.

A&B—9 to 10 inches, dark yellowish-brown (10YR 4/4) si clay loam; about 20 percent biscuit-shaped peds coa with dark-gray clay films and surrounded by bro silt loam mottled with gray; few fine pores; neutr clear, wavy boundary.

B21t—10 to 18 inches, dark yellowish-brown (10YR 4/4) si clay loam; moderate, medium, subangular blocky a prismatic structure; firm; patchy, dark grayish-bro clay films on some vertical and horizontal ped fa and in pores; many fine pores; common krotovinas dark grayish-brown and brown silt loam; moderat alkaline; gradual, wavy boundary.

B22tca—18 to 26 inches, brown (10YR 5/3) silty clay lo with common, distinct, yellowish-brown (10YR 5/ mottles; strong, medium and coarse, prismatic str ture; friable; common thin clay films on vertical a horizontal faces of most peds; common root chann filled with brown silt loam; common, soft and ha black and brown concretions; few hard concretions calcium carbonate; mildly alkaline; gradual, smoo boundary.

B3ca—26 to 32 inches, brown (10YR 5/3) heavy silt loa with common, distinct, yellowish-brown (10YR 5/ mottles; moderate, medium and coarse, prismat structure; friable; few very thin clay films on son vertical and horizontal faces of peds; common, so and hard, brown and black concretions; few carbona concretions 1 inch to 2 inches in diameter; mild alkaline; gradual, wavy boundary.

C1—32 to 51 inches, dark grayish-brown (2.5Y 4/2) silt loa with common, fine, prominent yellowish-brown (10Y 5/6) mottles; massive; friable; grayish-brown si loam in some root channels; many fine pores; fe soft, black concretions; mildly alkaline.

C2—51 to 75 inches, light olive-brown (2.5Y 5/6) silt loa with common, fine, faint, grayish-brown (2.5Y 5/2 and yellowish-brown (10YR 5/8) mottles; massive friable; common, soft, black concretions; mild alkaline.

The Ap horizon ranges from dark grayish brown to brow in color and from 5 to 10 inches in thickness. The A2 horizo where present, ranges up to 4 inches in thickness. The B2t hor zon ranges from dark brown to yellowish brown; dark-colore clay films cover the peds in most profiles. The texture of th B horizon ranges from silty clay loam to heavy silt loam. Th reaction is medium acid to mildly alkaline to a depth of 1 inches and neutral to moderately alkaline below that depth.

Freeland very fine sandy loam, 0 to 1 percent slopes (FvA).—This soil is in small areas on natural levees of the Amite River and its major tributaries, along the eastern border of the parish.

The surface layer is a brown, friable very fine sandy loam. The subsoil, to a depth of 24 inches, is brown or yellowish-red, friable silty clay loam mottled with shades of brown. The lower part is a firm, somewhat brittle fragipan of brown clay loam or sandy clay loam. The underlying material is yellowish-brown sandy clay loam. The reaction is medium acid to strongly acid in the surface layer and strongly acid to very strongly acid in the subsoil and fragipan.

Included in the areas mapped are small areas of Olivier, Loring, and Dexter soils.

This Freeland soil is fairly easy to work and to keep in good tilth. It is low in nitrogen, phosphorus, and potassium. Lime generally is needed.

Runoff is slow. Permeability is moderate above the fragipan and very slow within it. A few areas are subject to occasional floods of short duration. The supply of moisture is adequate for cultivated crops and pasture plants, except during dry periods that sometimes occur in summer and fall.

About 70 percent of the acreage is in forest containing pines and some hardwoods, 25 percent is in pasture, and a small acreage is cultivated.

This soil is suited to most crops commonly grown in the parish. (Capability unit I-2; woodland suitability group 2; wildlife suitability group 3)

Freeland very fine sandy loam, 1 to 3 percent slopes (FvB).—This soil is in small areas along the eastern border of the parish.

The surface layer is brown, friable very fine sandy loam about 6 to 7 inches thick. The subsoil, to a depth of 20 inches, is brown or yellowish-red, friable silty clay loam mottled with shades of brown. The lower part is a firm, somewhat brittle fragipan of brown or mottled silt loam, silty clay loam, or clay loam. The underlying material is yellowish-brown sandy clay loam.

Included in the areas mapped are small areas of Loring and Dexter soils and a few small areas on escarpments that have a slope range of 3 to 8 percent.

This Freeland soil generally is friable and is easy to work and to keep in good tilth. It is low in nitrogen, phosphorus, and potassium. The reaction ranges from medium acid to very strongly acid. Lime generally is needed.

Permeability is moderate above the fragipan and slow within it. The supply of moisture is adequate for cultivated crops and pasture plants, except during dry periods that sometimes occur in summer and fall. Erosion control is needed if clean-tilled crops are grown.

Most of the acreage is in pine forest, about 25 percent is in pasture, and a small part is cultivated.

This soil is well suited to most of the crops commonly grown in the parish. (Capability unit IIe-1; woodland suitability group 2; wildlife suitability group 3)

Frost Series

The Frost series consists of poorly drained, slowly permeable, acid soils that formed in loesslike material. These soils have a surface layer of grayish-brown or dark grayish-brown silt loam and a subsoil of light brownish-gray or gray silty clay loam mottled with shades of gray and brown.

Frost soils are on broad flats and in narrow depressions on broad terraces. They commonly adjoin Calhoun, Fountain, Bonn, Zachary, and Jeanerette soils. Frost soils are similar to Calhoun and Zachary soils in many respects but have dark-colored ped coatings. Frost soils are lighter colored and more acid than Jeanerette soils. They are also more acid than Fountain and Bonn soils, and they do not have the sodium content that is characteristic of Bonn soils.

Most areas of Frost soils are in forest consisting of mixed hardwoods and a few pines. Areas that have been cleared are used mostly for pasture but partly for cultivated crops.

Representative profile of Frost silt loam, in a pasture located 0.6 mile southwest of the Red and White Store and 0.2 mile west of Blackwater Road, in the southern part of sec. 35, T. 5 S., R. 1 E. Physical and chemical test data (sample No. S62La-17-45) are shown in table 8.

A1—0 to 3 inches, dark grayish-brown (10YR 4/2) silt loam; strong, medium and fine, granular structure; friable; brown films in some root channels; medium acid; clear, smooth boundary.

A2—3 to 11 inches, dark grayish-brown (10YR 4/2) silt loam with grayish-brown mottles; massive (structureless) breaking to rough, prismlike clods; firm in place but easily crushed; brown films in many root channels; medium acid; gradual, irregular boundary.

B&A—11 to 20 inches, dark-gray (10YR 4/1) heavy silt loam with common, fine, distinct, light brownish-gray (10YR 6/2), dark-brown (10YR 4/3), and yellowish-brown (10YR 5/6) mottles; weak, medium, prismatic structure; friable; many fine and coarse pores; thick tongues of light brownish-gray silt loam; a few dark-gray clay films in root channels; medium acid; gradual, wavy boundary.

B21tg—20 to 32 inches, finely mottled gray (5Y 5/1), dark-gray (10YR 4/1), light brownish-gray (10YR 6/2), and yellowish-brown (10YR 5/8) silty clay loam; moderate, medium, subangular blocky structure adhering as prismatic; firm; patchy, dark-gray clay films on ped faces and in pores; many fine pores; several vertical tongues of dark-gray silt loam; medium acid; gradual, wavy boundary.

B22tg—32 to 38 inches, light brownish-gray (10YR 6/2) silty clay loam with common, fine, distinct, yellowish-brown (10YR 5/6) mottles and many, fine, faint, gray (10YR 6/1) mottles; weak, medium, subangular blocky structure adhering as strong, prismatic; firm; numerous dark gray and very dark gray clay films on prisms and as veins and streaks in prisms; common thick tongues of dark-gray silt loam; medium acid; gradual, wavy boundary.

B23tg—38 to 52 inches, light brownish-gray (2.5Y 6/2) silty clay loam with common, fine, distinct, light olive-brown (2.5Y 5/4) mottles; moderate, coarse, prismatic structure; firm; thin, patchy clay films, dark gray on peds and very dark gray in pores; vertical tongues of dark-gray silt loam; few, soft, black concretions; medium acid; gradual, irregular boundary.

B3g—52 to 68 inches, light brownish-gray (2.5Y 6/2) silty clay loam with common, medium and coarse, yellowish-brown (10YR 5/8) mottles; weak, coarse, prismatic structure; friable; few tongues of dark-gray silt loam; mildly alkaline.

Cg—68 to 90 inches, light brownish-gray (2.5Y 6/2) silty clay loam with common, coarse, yellowish-brown (10YR 5/8) mottles; massive; friable; few, soft, black concretions; mildly alkaline.

The A horizon ranges from grayish brown to dark grayish brown in color and from 8 to 15 inches in thickness. It is dark gray or very dark gray to a depth of 2 to 5 inches in some areas. The B2t horizon ranges from gray mottled with brown to light brownish gray mottled with shades of brown. In structure it ranges from dominantly blocky to dominantly prismatic. The reaction is slightly acid to very strongly acid to a depth of 30 inches and medium acid to moderately alkaline below that depth.

Frost silt loam (Fw).—This level or nearly level soil is on broad flats and in depressions along drainageways throughout the northern half and the southeastern part of the parish.

The surface layer is dark grayish-brown or grayish-brown, friable silt loam about 6 to 10 inches thick. The subsoil is mottled grayish-brown, dark-gray, and gray silty clay loam that has dark-colored clay films and tongues of dark-gray and gray silt loam and many pores filled with dark-gray material. The mottles form a salt-and-pepper pattern.

Included in the areas mapped are small areas of Zachary, Calhoun, and Jeanerette soils. Also included are areas that are moderately alkaline below a depth of 30 inches, and small areas that have a loamy surface layer and a considerable amount of fine sand in the substratum.

This Frost soil is low in nitrogen, phosphorus, and potassium. It is very strongly acid to medium acid to a depth of about 30 inches and medium acid to mildly alkaline below that depth. Lime generally is needed.

This soil generally is wet in winter and spring and somewhat dry in summer and fall. Runoff is slow, and permeability also is slow. Many areas are flooded occasionally, and narrow areas along natural drainageways are flooded frequently. Drainage and possibly flood control are needed if cultivated crops and pasture plants are grown.

Two-thirds of the acreage is in mixed hardwood forest and most of the rest is used for pasture and hay. Only a few small areas are cultivated.

This soil is suited to most pasture crops commonly grown in the parish, but it is not so well suited to cultivated crops, because of the overflow hazard and periods of wetness and dryness. (Capability unit IIIw-4; woodland suitability group 1; wildlife suitability group 1)

Jeanerette Series

The Jeanerette series consists of poorly drained, moderately slowly permeable, dark-colored, alkaline soils that formed in loesslike material. These soils have a surface layer of dark-gray to very dark brown or black silt loam and a subsoil of silty clay loam that is black to dark gray in the upper part and light olive brown in the lower part. The underlying material is light olive-brown silt loam mottled with gray and brown.

Jeanerette soils occur on broad flats and in depressions, mainly in the south-central part of the parish. They commonly adjoin Calhoun, Zachary, Frost, and Jeanerette soils, light-colored variant. Jeanerette soils have a darker colored surface layer than Jeanerette soils, light-colored variant. Jeanerette soils are darker colored and less acid than Calhoun, Zachary, and Frost soils.

About half the acreage of Jeanerette soils has been developed for urban use. A small acreage is used for cultivated crops and pasture plants, and the rest is dominantly in mixed hardwood forest.

Representative profile of Jeanerette silt loam, in a wooded area located 1.9 miles west-northwest of the traffic circle at the intersection of U.S. Highway No. 190 and No. 61, in sec. 79, T.7 S., R. 1 E.

A11—0 to 3 inches, very dark grayish-brown (10YR 3/2) silt loam; strong, medium and fine, granular structure; friable; many fine roots and fine pores; slightly acid; abrupt, smooth boundary.

A12—3 to 5 inches, very dark gray (10YR 3/1) silt loam; moderate to strong, fine, granular structure; friable; many fine pores; neutral; gradual, smooth boundary.

B21t—5 to 10 inches, very dark gray (10YR 3/1) silty clay loam; strong, medium and coarse, prismatic and subangular blocky structure; slightly plastic; few, patchy, black clay films on ped faces; few fine pores; mildly alkaline; diffuse, irregular boundary.

B22t—10 to 20 inches, dark grayish-brown (2.5Y 4/2) and light olive-brown (2.5Y 5/4) silty clay loam with dark-gray (10YR 4/1) and black (10YR 2/1) mottles; slightly plastic; almost continuous, thin clay films on ped faces; mildly alkaline; abrupt, irregular boundary.

B23t—20 to 30 inches, light olive-brown (2.5Y 5/4) silty clay loam with common, fine, faint, grayish-brown (2.5Y 5/2) mottles and common, fine, prominent mottles or weak concretions of yellowish brown (10YR 5/8); common fine pore fillings or mottles of dark gray; moderate, coarse, prismatic structure; slightly plastic; numerous dark gray and very dark gray clay films on ped faces; few thin tongues of dark-gray silt; many very fine pores; 5 to 10 percent hard silica-lime concretions, ⅛ inch to 1½ inches in diameter; mildly alkaline; diffuse, wavy boundary.

B3t—30 to 48 inches, light olive-brown (2.5Y 5/4) silty clay loam or silt loam with many, fine, faint, grayish-brown (2.5Y 5/2) mottles; many pore fillings of dark gray and very dark gray; weak, coarse, prismatic structure with patchy, very dark gray clay films on some ped faces; few tongues of dark-gray silt loam; numerous very fine pores; few, hard, brown and black concretions; mildly alkaline.

The A horizon ranges from 5 to 16 inches in thickness and from very dark brown or very dark gray to black in color. Lime concretions generally do not occur in the uppermost 16 inches. The reaction ranges from medium acid to moderately alkaline in the uppermost 12 to 14 inches.

The B21t horizon ranges from dark gray to black in color and from 5 to 10 inches in thickness. The B22t horizon ranges from silt loam to silty clay loam in texture, from 10 to 24 inches in thickness, and from light olive brown to pale olive or light yellowish brown in color. Light brownish-gray (2.5Y 6/2) mottles are common throughout the B23t horizon. Lime concretions generally occur at a depth of 16 to 60 inches. The reaction ranges from mildly alkaline to moderately alkaline.

Jeanerette silt loam (Je).—This soil is on broad flats and in shallow concave areas, in a strip that extends southeastward from the west-central part of the parish.

The surface layer is dark-gray, very dark brown, or black, friable silt loam and is 5 to 12 inches thick. The subsoil of silty clay loam is dark-gray in the upper part and light olive gray in the lower part. The underlying material is light olive-gray silt loam or silty clay loam.

Included in the areas mapped are small areas of Jeanerette soils, light-colored variant, and of Fred and Frost soils.

Jeanerette silt loam has good structure and is easy to keep in good tilth. It is low in nitrogen and medium in phosphorus and potassium. The reaction ranges from medium acid to moderately alkaline in the surface layer and from neutral to moderately alkaline in the subsoil. A few lime concretions are normally present in the subsoil.

Runoff is slow, and permeability is moderately slow. In most years the moisture supply is adequate for cultivated crops and pasture plants. Some areas are subject to occasional floods. Drainage is needed if this soil is used for cultivated crops and pasture.

About two-thirds of the acreage has been developed for urban use, 30 percent is in mixed hardwood forest, and a small acreage is in pasture and cultivated crops.

This soil is well suited to most of the crops commonly grown in the parish. (Capability unit IIw–1; woodland suitability group 5; wildlife suitability group 2)

Jeanerette-Frost silt loams (Jt).—About 60 percent of this mapping unit consists of poorly drained Jeanerette soil, and 30 percent consists of poorly drained Frost soil. These soils are on broad flats and in depressions, mainly in the south-central part of the parish.

The surface layer of the Jeanerette soil is dark gray, very dark gray, or black, friable silt loam that is 5 to 12 inches thick. The subsoil is dark-gray or olive-brown silty clay loam.

The Frost soil has a grayish-brown surface layer about 6 to 10 inches thick. The subsoil is light brownish-gray or gray silty clay loam that is mottled with shades of gray and brown and has coatings of dark-gray clay.

Included in the areas mapped are small areas of Jeanerette soils, acid variant; of Jeanerette soils, light-colored variant, and of Fred, Verdun, and Deerford soils.

Jeanerette-Frost silt loams are low to moderate in nitrogen, phosphorus, and potassium. The reaction ranges from slightly acid to moderately alkaline in the Jeanerette soil and from slightly acid to very strongly acid in the Frost soil.

The Jeanerette soil has slow runoff and moderately slow permeability. The Frost soil has very slow runoff and slow permeability. Some areas of both soils are subject to occasional floods. In most years the Jeanerette soil has an adequate supply of moisture. The Frost soil generally is wet in winter and spring and is sometimes dry in summer and fall. These soils need to be drained if used for cultivated crops and pasture.

About 70 percent of the acreage of Jeanerette-Frost silt loams is in mixed hardwood forest, nearly 27 percent has been developed for urban use, and a small percentage is in pasture.

These soils are suited to most of the crops commonly grown in the parish. (Capability unit IIIw–4; woodland suitability group 5 for the Jeanerette soil and 1 for the Frost soil; both soils are in wildlife suitability group 2)

Jeanerette Series, Light-Colored Variant

The Jeanerette series, light-colored variant, consists of poorly drained, slowly permeable, alkaline soils that formed in loesslike material. These soils are similar to normal Jeanerette soils in many respects but are outside the series range, principally because of their light-colored surface layer. The surface layer of these soils is grayish-brown or dark grayish-brown silt loam in the upper part and very dark gray or black silt loam in the lower part. The subsoil is very dark gray silty clay loam in the upper part and light olive-brown silty clay loam mottled with brown in the lower part. The underlying material is a light olive-brown silt loam.

Jeanerette soils, light-colored variant, are level or depressional soils in the southern and northeastern parts of the parish. They commonly adjoin Calhoun, Zachary, Frost, and normal Jeanerette soils. Jeanerette soils, li colored variant, are less acid than Calhoun, Zachary, Frost soils and contain darker colored horizons in the face layer and subsoil.

About half the acreage is in mixed hardwood fores percent is used for pasture, and the rest has been devel for urban use.

Representative profile of Jeanerette silt loam, li colored variant, located in the central part of sec. 41, T. R. 1 E.

A11—0 to 5 inches, dark grayish-brown (10YR 4/2) silt with common, fine, distinct mottles of grayish b (10YR 5/2) and light brownish gray (10YR 6 moderate, medium and fine, granular structure. able; common brown and strong-brown coatings in channels; common fine pores; slightly acid; c smooth boundary.

A12—5 to 12 inches, dark grayish-brown (10YR 4/2) silt l weak, medium to coarse, prismatic structure; fri common root channel coatings of yellowish br common fine and coarse pores; mildly alkaline; c wavy boundary.

B1—12 to 18 inches, very dark gray (10YR 3/1) silty loam; weak, medium, prismatic and subang blocky structure; friable; common fine pores; mon root channels filled with vertical veins of grayish-brown silt loam; common, soft and brown and black concretions; mildly alkaline; gra wavy boundary.

B21t—18 to 22 inches, light olive-brown (2.5Y 5/4) silty loam with common mottles and fine veins of very grayish brown (2.5Y 3/2); strong prismatic angular blocky structure; thin, patchy, very grayish-brown clay films; friable; common fine po few, soft and hard, black and brown concretions; mon vertical veins of very dark grayish-brown loam; moderately alkaline; gradual, irreg boundary.

B22t—22 to 26 inches, light olive-brown (2.5Y 5/4) silty loam; strong, medium and fine, prismatic and ang blocky structure; friable; thin clay films of dark g ish brown; common, medium and fine pores; com soft and hard, black concretions; moderately alkal gradual, irregular boundary.

B31ca—26 to 34 inches, light olive-brown (2.5Y 5/4) light clay loam; strong, medium, prismatic structure moderate, medium, angular blocky structure; olive-brown clay films on peds; friable; some channels filled with olive-brown clay; common pores; common, soft and hard, black and brown cretions; common hard silica-lime concretions; mo ately alkaline; gradual, irregular boundary.

B32ca—34 to 46 inches, light olive-brown (2.5Y 5/4) he silt loam with common fine mottles of light olive br (2.5Y 5/6) and grayish brown (2.5Y 5/2); mo ate, medium and coarse, prismatic structure; fria most prism faces coated with thin clay films of o brown; few root channels filled with very dark g ish-brown clay; common fine pores; few, soft and h black and brown concretions; few hard silica-l concretions; moderately alkaline; gradual, w boundary.

C1—46 to 55 inches, light olive-brown (2.5Y 5/6) silt lo massive; friable; common fine pores; few large p coated with very dark grayish-brown clay; com vertical veins and channels filled with grayish-br and light olive-brown silt loam; common, soft and h black and brown concretions; moderately alkaline

C2—55 to 90 inches, light olive-brown (2.5Y 5/6) silt l with common coarse mottles or vertical veins of g ish-brown silt loam; massive; friable; 7 to 10 per black and brown concretions; moderately alkaline

The A11 horizon ranges from dark grayish brown to gray brown in color and from 5 to 8 inches in thickness. The horizon ranges from very dark gray to grayish brown in c and 4 to 8 inches in thickness. The reaction of the A hori s from medium acid to mildly alkaline. The B1 horizon from very dark gray to black in color, and the B2 hori-rom light olive brown with brown mottles to very dark gray.

Jeanerette silt loam, light-colored variant (Jr).—This oil is on broad flats and along drainageways throughout he parish.

The light-colored surface layer is the result of recent leposition. The subsoil, to a depth of 46 inches, is friable silty clay loam that is very dark gray in the upper part and ight olive brown in the lower part. The lower part is nottled with grayish brown and has dark-colored clay ilms. The underlying material is light olive-brown silt oam. Soft and hard, brown and black concretions comnonly occur in all horizons.

This soil is easy to work but tends to crust. It is low in nitrogen and moderate in phosphorus and potassium. The reaction ranges from medium acid to mildly alkaline in he surface layer and from mildly alkaline to moderately alkaline in the subsoil and substratum. A few lime concretions occur in most places below a depth of about 20 inches.

This soil generally is wet in winter and spring. Some areas are subject to occasional flooding, and areas along drainageways are subject to frequent flooding. Runoff is slow, and permeability is moderately slow. Drainage and possibly flood control are needed if cultivated crops and pasture plants are grown. In most years the supply of moisture is adequate for crops.

About half the acreage is in mixed hardwood forest, a small acreage is cultivated, and the rest is chiefly in pasture an

T soil is suited to most of the locally grown crops. (Capability unit IIw–1; woodland suitability group 5; wildlife suitability group 1)

Jeanerette, light-colored variant-Frost silt loams (Jv).—These are poorly drained soils in shallow depressions and natural drainageways throughout the parish.

The surface layer of the Jeanerette soil is grayish brown in the upper part and very dark gray in the lower part. The subsoil, which extends to a depth of about 30 inches, is friable silty clay loam that is very dark gray in the upper part and light olive brown mottled with grayish brown in the lower part. The underlying material is light olive-brown, friable silt loam mottled with grayish brown.

The Frost soil has a grayish-brown, friable surface layer. The subsoil, to a depth of 36 inches, is gray, slightly plastic silty clay loam that is mottled with brown and with dark-colored clay films and is tongued with dark-colored silt loam. The underlying material is grayish-brown or brown, friable silt loam or silty clay loam and is mottled with gray.

Included in the areas mapped are small areas of Calhoun, Zachary, and Fountain soils.

Both the Jeanerette soil and the Frost soil are low in nitrogen and low to moderate in phosphorus and potassium. The surface layer of the Jeanerette soil is medium acid to mildly alkaline. The subsoil is moderately alkaline and mally contains lime concretions. The surface layer and er part of the subsoil of the Frost soil are slightly aci o very strongly acid. The lower part of the subsoil a substratum are strongly acid to mildly alkaline.

ese soils generally are wet in winter and spring. Runoff is slow, and permeability is slow. Some areas are subject to occasional floods. Drainage and possibly flood control are needed if cultivated crops and pasture plants are grown. The Jeanerette soil has an adequate supply of moisture in most years, but the Frost soil is somewhat dry in summer and fall.

About 50 percent of the acreage is in mixed hardwood forest, 40 percent is in pasture and hay, and 10 percent has been developed for urban use.

These soils are suited to most of the locally grown crops. (Capability unit IIIw–4; woodland suitability group 5 for the Jeanerette soil and 1 for the Frost soil; both soils are in wildlife suitability group 1)

Jeanerette Series, Acid Variant

The Jeanerette series, acid variant, consists of poorly drained, slowly permeable, acid soils that formed in loesslike material. These soils are similar to the normal Jeanerette soils in many respects but are outside the range of the series, principally because of their acid reaction throughout. These soils have a surface layer of black or dark-gray silt loam about 10 to 12 inches thick and a subsoil of gray silty clay loam mottled with black. The underlying material is gray silt loam mottled with brown and white.

Jeanerette soils, acid variant, are in shallow depressions, or potholes, ½ to 3 acres in size, and are mainly in the southern half of the parish. They commonly adjoin Frost, Calhoun, Fountain, normal Jeanerette, and light-colored Jeanerette soils. Jeanerette soils, acid variant, are similar to normal Jeanerette soils and light-colored Jeanerette soils in many respects but are more acid throughout and are more poorly drained. Acid Jeanerette soils have a darker colored surface layer and subsoil than Frost, Calhoun, and Fountain soils. Most areas are in mixed hardwood forest. Some are used for grazing, and many are used as sites for stock ponds.

Representative profile of Jeanerette silt loam, acid variant, located 1 mile northwest of Zachary and 50 yards south of Rollins Road in NE¼ of sec. 83, T. 4 S., R. 1 W.

A11—0 to 4 inches, black (10YR 2/1) silt loam; strong, fine and medium, granular structure; friable; very strongly acid; clear, smooth boundary.

A12—4 to 6 inches, black (10YR 2/1) silt loam; moderate, medium, subangular blocky structure; slightly firm; very strongly acid; diffuse, irregular boundary.

A13—6 to 12 inches, very dark gray (10YR 3/1) silt loam; moderate, medium, prismatic and subangular blocky structure; very strongly acid; diffuse, irregular boundary.

B1tg—12 to 18 inches, dark-gray (10YR 4/1) silty clay loam with many fine mottles of gray (10YR 6/1); strong, medium, prismatic structure; friable; peds, pores, and root channels coated with black clay films; very strongly acid; diffuse, irregular boundary.

B21tg—18 to 30 inches, light brownish-gray (10YR 6/2) silty clay loam; strong, coarse, prismatic structure; friable; numerous pores and root channels coated with black clay films; prisms coated with almost continuous black clay films; very strongly acid; gradual, irregular boundary.

B22tg—30 to 38 inches, light brownish-gray (10YR 6/2) silty clay loam; 5 to 10 percent fine specks or mottles of white (10YR 8/2) and about 3 percent light olive-brown mottles; moderate to strong, coarse, prismatic structure; friable; prisms coated with patchy black clay films; common tongues of dark-gray silt loam; many fine pores; a few balls of dark-gray silt loam mottled with gray and having thin coatings of black clay; very strongly acid; diffuse, irregular boundary.

B3tg—38 to 48 inches, gray silt loam; 15 percent yellowish-brown (10YR 5/6) mottles and few, white (10YR 8/2), specklike mottles; moderate, coarse, prismatic structure; friable; pores and root channels coated with black clay; prisms coated with continuous coatings of dark-gray silt loam and patchy black clay films; some root channels coated with brown oxidized material; strongly acid.

The A horizon ranges from 10 to 16 inches in thickness and from dark gray to black in color. The B horizon ranges from dark gray to brownish gray or gray in color. The reaction ranges from strongly acid to very strongly acid.

Jeanerette silt loam, acid variant (Jn).—This soil is in a few concave areas ranging from half an acre to 3 acres or more in size and is mainly in the southern and west-central parts of the parish.

The surface layer is dark-gray or black, friable silt loam and is 10 to 12 inches thick. The subsoil is gray silty clay loam. Many pores filled with black clay give it a mottled appearance. There are black clay films and dark-colored coatings of silt loam on the peds. The substratum is dominantly gray.

This soil is fairly well supplied with plant nutrients and is acid throughout. It is high in organic-matter content, and in places the surface layer is mucky silt loam. Permeability is very slow. Most areas have no outlets and, except in dry periods, are filled with water.

Most of this soil is in mixed hardwood forest. Some areas are used for grazing in summer, when the water level is low. Water-tolerant trees and grasses are the most suitable plants. (Capability unit Vw-1; woodland suitability group 4; wildlife suitability group 4)

Lafe Series

The Lafe series consists of somewhat poorly drained, very slowly permeable soils that formed in loesslike material. These soils have an acid surface layer and an alkaline subsoil. The sodium content is high in the subsoil. These soils have a surface layer of dark-brown to grayish-brown silt loam and a subsoil of yellowish-brown and grayish-brown silty clay loam or heavy silt loam mottled with gray and shades of brown. The underlying material is gray silt loam mottled with brown.

Lafe soils are nearly level soils in small areas throughout the parish. They commonly adjoin Essen, Deerford, Olivier, Bonn, Fountain, Frost, and Calhoun soils. Lafe soils are similar to Bonn soils but have a browner subsoil. They are better drained than Fountain, Frost, and Calhoun soils, all of which lack a high content of sodium. Olivier and Essen soils are not high in sodium, and Deerford soils have high sodium content only in the lower horizons.

Most areas of Lafe soils are in pasture.

Representative profile of Lafe silt loam, in a pasture located 0.2 mile west of State Route 964, SW¼ sec. 52, T. 4 S., R. 1 W.

Ap1—0 to 4 inches, dark-brown (10YR 4/3) silt loam; coarse irregular clods that break to moderate, fine and coarse, granular structure; friable; 5 percent soft and hard, yellowish-brown concretions; strongly acid; clear, smooth boundary.

Ap2—4 to 7 inches, brown (10YR 5/3) silt loam with many, fine, faint, dark-brown (10YR 4/3) mottles; massive clods that break to weak, platy structure; slightly firm; 7 percent soft and hard, dark yellowish-brown concretions; strongly acid; abrupt, smooth boundary.

A21—7 to 11 inches, dark grayish-brown (10YR 4/2) s loam; coarse clods that break to weak, coarse, gran lar structure and weak, thick, platy structure; sligh firm; 5 percent worm casts of brown and very da grayish-brown color; many fine roots and a few pore few, small, brown concretions; very strongly aci abrupt, smooth boundary.

A22—11 to 13 inches, grayish-brown (10YR 5/2) silt loam wi common, fine, prominent, dark-brown (10YR 4/ mottles; massive, porous clods; firm; 25 to 35 perce soft and hard, brown and black concretions; ve strongly acid; abrupt, irregular boundary.

B21t—13 to 18 inches, yellowish-brown (10YR 5/4) silty cl loam with many, fine, faint, grayish-brown (10YR 5/ mottles; moderate, medium, prismatic structure a moderate, medium, subangular blocky structure; firm almost continuous, dark-gray clay films on ped face some thin tongues of grayish-brown silt loam; we concretions of yellowish brown; 10 percent soft a hard, brown and black concretions; medium aci gradual, smooth boundary.

B22t—18 to 24 inches, grayish-brown (10YR 5/2) silty cl loam with many, fine, faint, yellowish-brown (10Y 5/4) mottles; moderate, medium, prismatic a medium subangular blocky structure; firm; patch dark-gray clay films on a few peds; clay films comm in some pores and root channels; 5 to 10 percent so and hard, brown and black concretions; neutral; di fuse, irregular boundary.

B3g—24 to 36 inches, gray (10YR 5/1) heavy silt loam wi common, fine, distinct, yellowish-brown (10YR 5/4 mottles; weak, coarse, prismatic structure; slightl plastic; numerous very fine pores; 5 to 10 percent so and hard, brown and black concretions; mildly alk line; diffuse, irregular boundary.

Cg—36 to 42 inches, gray (10YR 5/1) silt loam with commo fine, distinct, yellowish-brown (10YR 5/4) mottles massive; friable; 5 to 10 percent soft and hard, brow and black concretions; mildly alkaline.

The Ap horizon ranges from dark brown to grayish brow in color and from 4 to 12 inches in thickness. The A2 horizo generally is dark grayish brown and is 4 to 6 inches thicl The reaction is very strongly acid to moderately alkaline i the A horizon. It typically is neutral to moderately alkalin in the B horizon, except in the uppermost 5 inches, whic ranges to medium acid.

Lafe silt loam (La).—This soil is in small, widely scat tered areas throughout the parish. Most of it is level o nearly level, but some areas have a slope range of 1 or 2 percent.

The surface layer is grayish-brown or brown, friable t firm silt loam. The subsoil, to a depth of 24 inches, is yellowish-brown, firm silty clay loam that is mottled wit gray and shades of brown and has almost continuous pec coatings of dark-gray clay, especially in the upper half The subsoil has a high content of sodium and generally remains dry even in wet periods. The underlying material is firm to friable silt loam mottled with brown.

Included in the areas mapped are small areas of Olivier, Essen, Calhoun, and Fountain soils.

Keeping this Lafe soil in good tilth is difficult. The surface layer is strongly acid to moderately alkaline, and the subsoil normally is alkaline. The root zone is favorable to a depth of only 4 to 6 inches.

Runoff is slow, and permeability is very slow. Water stands in some areas for a few days after heavy rains. During the drier periods in summer and fall, the supply of moisture is not adequate for cultivated crops and pasture plants. Drainage is needed in some places if these crops are grown.

This soil is suitable for shallow-rooted plants that grow in cool seasons, when the moisture supply is favorable.

Ca ity unit IIIs-1; woodland suitability group 5; il uitability group 2)

,oamy Alluvial Land

Loamy alluvial land and Mhoon soils, overflow (Lm) is ıainly on Profit Island and along the western border of ıe parish. It is not protected and consequently is subject ɔ frequent flooding and to scouring and deposition. Most reas are level, but small areas have a slope of 1 or 2 perent. The supply of plant nutrients is high. The reaction is eutral to moderately alkaline.

Loamy alluvial land is made up of stratified grayishrown, brown, and gray silt loam, silty clay loam, and andy loam. The Mhoon soils, which are at a slightly ɔwer elevation, are gray mottled with brown.

Included in the areas mapped are about 1,600 acres of ilty and clayey material that was moved in during the onstruction of a barge canal and spread over the flood ılain.

These areas are in mixed hardwood forest. Most are .ccessible only from the river. Some of the higher, drier .reas are capable of producing good-quality forage. Capability unit Vw-2; woodland suitability group 6; vildlife suitability group 4)

,oring Series [1]

The Loring series consists of moderately well drained, noderately to slowly permeable, acid soils that formed in oes material. These soils have a surface layer of darkıro o brown silt loam and a subsoil of darkırown, yellowish-brown, or yellowish-red silty clay loam. The lower part of the subsoil is a thick, somewhat brittle ragipan of brown or yellowish-brown silt loam or silty :lay loam.

Loring soils are nearly level to moderately sloping, and ›ccur dominantly along the Amite and Comite Rivers and ılong the northern border of the parish. They commonly ıdjoin Dexter, Freeland, and Memphis soils. Loring soils ıre somewhat similar to Dexter and Freeland soils but :ontain less sand. They are not so well drained as Memphis soils, which lack a fragipan. They are better drained than Olivier soils.

About half the acreage of Loring soils is used primarily for pasture, a small acreage is used for cultivated crops, ınd the rest has been developed for urban use or is in forest consisting of mixed hardwoods and pines.

Representative profile of Loring silt loam, in a cultivated field located in the northern part of sec. 49, T. 7 S., R. 1 E. Physical and chemical test data (sample No. 562La-17-48) are shown in table 8, and clay mineral data ıre shown in table 9.

Ap1—0 to 4 inches, dark-brown (10YR 4/3) silt loam; strong, fine and medium, granular structure; friable; slightly acid; clear, smooth boundary.

Ap2—4 to 6 inches, dark-brown (10YR 4/3) silt loam; massive (structureless) to weak, thick, platy structure; friable; many fine and coarse pores and roots; common worm casts of pale brown; strongly acid; clear, smooth boundary.

—6 to 11 inches, brown (10YR 5/3) silt loam with common, fine, faint, pale-brown (10YR 6/3) and grayish-brown (10YR 5/2) mottles and common, fine, distinct, brownish-yellow (10YR 6/6) mottles; strong, medium and thick, platy structure; firm; very strongly acid; abrupt, smooth boundary.

B2t—11 to 22 inches, dark-brown (7.5YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; friable; thin, patchy, dark-brown clay films on both horizontal and vertical ped faces; dark-colored manganese coatings on a few peds; many fine and coarse pores; very strongly acid; abrupt, wavy boundary.

Bx1—22 to 36 inches, dark yellowish-brown (10YR 4/4) heavy silt loam; strong, medium and coarse, prismatic structure; firm; prisms contain a few fine pores; patchy clay films of dark yellowish brown and some black manganese coatings; common vertical veins of brown silt loam; very strongly acid; gradual, irregular boundary.

Bx2—36 to 52 inches, yellowish-brown (10YR 5/6) silt loam; moderate, coarse, prismatic structure; firm; prisms contain fine pores; few, patchy, dark yellowish-brown clay films; common vertical veins and fracture planes filled with brown and light brownish-gray silt loam; few, soft, brown concretions; very strongly acid.

The Ap horizon ranges from brown to dark brown in color and from 5 to 9 inches in thickness. The A2 horizon is as much as 6 inches thick in some places but normally is not present in eroded areas. The B2t horizon ranges from brown to yellowish red in color and, in places, is mottled with brown and yellowish brown. It ranges from 8 to 16 inches in thickness. In color, the Bx horizon ranges from brown to brown mottled with grayish brown and gray, and in texture, from silt loam to silty clay loam. The surface layer is slightly acid to very strongly acid, and the subsoil, including the fragipan, is strongly acid to very strongly acid.

Loring silt loam, 0 to 1 percent slopes (LoA).—This soil occurs mainly in the eastern part of the parish and along the northern and northeastern borders.

The surface layer is brown, friable silt loam and is about 9 inches thick. The subsoil, to a depth of 24 inches, is dark-brown or yellowish-red, friable silty clay loam. Beneath this layer is a firm, somewhat brittle fragipan of brown silt loam or silty clay loam that extends to a depth of 40 to 60 inches and is tongued with gray silt loam. A few brown and black concretions occur throughout the soil material.

Included in the areas mapped are small areas of Olivier and Memphis soils.

This Loring soil is easy to work and generally is in good tilth. It is low in nitrogen, phosphorus, and potassium. The reaction ranges from slightly acid to very strongly acid. Lime generally is needed.

Runoff is slow. Permeability is moderate above the fragipan and slow within it. The supply of moisture is adequate for cultivated crops and pasture plants, except during the dry periods that sometimes occur in summer and fall.

About 30 percent of the acreage is in forest consisting of mixed hardwoods and pines, 25 percent has been developed for urban use, a small acreage is used for cultivated crops, and the rest is mostly used for pasture and hay.

This soil is well suited to most of the crops commonly grown in the parish. (Capability unit I-2; woodland suitability group 3; wildlife suitability group 3)

Loring silt loam, 1 to 3 percent slopes (LoB).—About half of this soil is along the northern border of the parish, and about half is in the northeastern and eastern parts.

The surface layer is brown, friable silt loam about 8 inches thick. The subsoil, to a depth of 21 inches, is brown,

[1] This series includes soils that were formerly called Grenada ınd Richland soils in this parish.

friable silty clay loam. Beneath this layer is a firm, somewhat brittle fragipan of brown silt loam or silty clay loam that is 2 or more feet thick.

Included in the areas mapped are small areas of Memphis and Olivier soils.

This Loring soil is fairly easy to work and to keep in good tilth. It is low in nitrogen, phosphorus, and potassium. The reaction ranges from slightly acid to very strongly acid. Lime generally is needed.

Runoff is medium, and permeability is moderately slow. The supply of moisture is adequate for cultivated crops and pasture plants, except during dry periods that sometimes occur in summer and fall. Erosion is a hazard if the surface is left bare. Erosion control is needed if clean-tilled crops are grown.

About 40 percent of the acreage is in forest consisting of mixed hardwood and pines, 40 percent is in pasture, and a small acreage is in cultivated crops.

This soil is suited to most of the crops commonly grown in the parish. (Capability unit IIe-1; woodland suitability group 3; wildlife suitability group 3)

Loring silt loam, 3 to 5 percent slopes, eroded (LoC2).—This soil is in many, small, widely scattered areas throughout the parish.

The surface layer is brown, friable silt loam about 7 inches thick. The subsoil, to a depth of 17 inches, is brown, yellowish-brown, or yellowish-red, friable silty clay loam. Beneath this layer is a firm, somewhat brittle fragipan of brown silt loam or silty clay loam.

This soil is fairly easy to work and to keep in good tilth. It is low in nitrogen, phosphorus, and potassium. The reaction ranges from slightly acid to very strongly acid. Lime generally is needed.

Runoff is rapid, and permeability is moderately slow. The supply of moisture is adequate for cultivated crops and pasture plants, except during dry periods that sometimes occur in summer and fall. Erosion is a hazard if the surface is left bare. Erosion control is needed if clean-tilled crops are grown.

About 40 percent of the acreage has been developed for urban use, 30 percent is in forest consisting of mixed hardwoods and pines, 26 percent is in pasture and hay, and a small acreage is in cultivated crops. This soil is suited to most of the crops commonly grown in the parish. (Capability unit IIIe-1; woodland suitability group 3; wildlife suitability group 3)

Loring silt loam, 5 to 8 percent slopes, eroded (LoD2).—This soil occurs only in small areas on the Perkins Road Farm of the Louisiana Agricultural Experiment Station.

The surface layer is brown, friable silt loam about 5 inches thick. The subsoil, to a depth of 16 inches, is brown or yellowish-red, friable silty clay loam. Beneath this layer is a brown, somewhat brittle fragipan that is at least 2 feet thick.

This soil is low in nitrogen, phosphorus, and potassium. It ranges from strongly acid to very strongly acid. Lime generally is needed.

Runoff is rapid, and permeability is slow. The supply of moisture is adequate for cultivated crops and pasture plants, except during dry periods that sometimes occur in summer and fall. Erosion is a major hazard if the surface is left bare. Very intensive erosion control is needed if clean-tilled crops are grown.

This soil is suited to most of the crops commonly gr in the parish. (Capability unit IIIe-1; woodland s ability group 3; wildlife suitability group 3)

Made Land

Made land (Ma) consists of 2 to 4 feet of soil mate mostly gray silt loam or silty clay loam, that was remo as spoil material in the construction of drainage canals ditches. The reaction is strongly acid to moderately al line. About 70 percent of the acreage has been smootl

Included in the areas mapped are areas that have b filled and used for building foundations, and small a that have been stripped of 2 or 3 feet of soil material leveled for building sites.

The smoothed areas are used for pasture, or are in mi hardwood forest, or have been developed as building si The unsmoothed areas are in weeds, volunteer grasses, small trees. (Capability unit IIIw-4; woodland suitabi group 1; wildlife suitability group 1)

Memphis Series [2]

The Memphis series consists of well-drained, moderat permeable, acid soils that formed in loesslike mater These soils have a surface layer of dark-brown to grayi brown silt loam and a subsoil of brown to dark-brown dark reddish-brown silty clay loam. The underlying terial is brown or dark-brown silt loam.

Memphis soils are nearly level to moderately slop soils scattered throughout the parish. They commonly join Loring and Olivier soils, which they resemble in m respects, but Memphis soils are better drained and do have a fragipan.

About equal acreages of Memphis soils have been veloped for urban use, are used for cultivated crops, are in pasture. Only a small acreage is in forest.

Representative profile of Memphis silt loam, in a cu vated field located in the central part of sec. 67, T. 7 S., 1 W. Physical and chemical test data (sample S62La- 54) are shown in table 8, and clay mineral data are sho in table 9.

Ap1—0 to 4 inches, dark-brown (10YR 4/3) silt loam; str medium and fine, granular structure; friable; com worm casts; medium acid; abrupt, smooth bound

Ap2—4 to 8 inches, grayish-brown (10YR 5/2) silt loa moderate, medium, platy structure; firm; many da brown worm casts; few, soft, brown and black cretions; medium acid; clear, smooth boundary.

B21t—8 to 18 inches, dark-brown (7.5YR 4/4) silty clay loa moderate, medium, subangular blocky structure; able; common, thin, dark reddish-brown clay skins ped faces; brown silt loam in common vertical ve root channels, and worm casts; common large small pores; strongly acid; gradual, wavy bounda

B22t—18 to 36 inches, dark-brown (7.5YR 4/4) light silty c loam; moderate, medium and coarse, subangu blocky structure and moderate, coarse, prisma structure; friable; common dark reddish-brown c skins on horizontal and vertical faces of peds; p brown and dark-brown silt loam common in r channels; many fine and coarse pores; very stron acid; gradual, wavy boundary.

B3—36 to 48 inches, dark-brown (7.5YR 4/4) heavy silt loa weak, medium, subangular blocky structure and we coarse, prismatic structure; friable; patchy, dark r

[2] This series includes soils that were formerly called Linto soils in this parish.

stratum to a depth of about 60 inches is stratified reddish brown silt loam and very fine sandy loam.

This Latanier soil has high fertility. Water and air move through this soil at a very slow rate. Water runs off the surface at a slow rate. A seasonal high water table ranges from 1 foot to 3 feet below the soil surface during December through April. Floodwater typically is from 1 to 3 feet deep but as deep as 10 feet in some years. The surface layer is very sticky when wet and very hard when dry. The available water capacity is high. The shrink-swell potential is very high.

Typically, the Moreland soil has a dark reddish brown clay surface layer about 10 inches thick. The subsoil to a depth of about 60 inches is reddish brown clay in the upper and middle parts and dark reddish brown clay in the lower part.

This Moreland soil has high fertility. Water and air move through this soil at a very slow rate. Water runs off the surface at a slow rate. A seasonal high water table ranges from the soil surface to 1.5 feet below the surface during December through April. Flooding occurs for brief to long periods in winter, spring, and early summer. Floodwater typically is 1 foot to 3 feet deep, but the depth exceeds 10 feet in places. The available water capacity is moderate or high. The shrink-swell potential is very high.

Included with the Latanier and Moreland soils in mapping are a few small areas of Sharkey soils. These soils are in positions similar to those of the Moreland soil and have a gray subsoil. The included soils make up about 10 percent of the map unit.

The entire acreage of Latanier and Moreland soils is used as woodland or cropland.

These soils are moderately well suited to use as woodland, mainly hardwood trees. The main management concerns in producing and harvesting timber are wetness and flooding, which limit the use of equipment and cause a moderate rate of seedling mortality. Because the clayey soil is sticky when wet, most planting and harvesting equipment can be used only during dry periods. Only trees that can tolerate seasonal wetness should be planted. After harvesting, reforestation can be carefully managed to reduce competition from undesirable understory plants.

These soils are moderately well suited to pasture. The main limitation is wetness, and flooding is a hazard. The main pasture plant is common bermudagrass. During flood periods, cattle can be moved to adjacent protected areas or to pastures at a higher elevation. Where suitable outlets are available, excess surface water can be removed by shallow ditches. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture and soil in good condition.

These soils are poorly suited to cultivated crops. The main limitations are the hazard of flooding; wetness; poor tilth; and short, choppy slopes. The main suitable crops are soybeans and grain sorghum. This soil is sticky when wet and hard when dry, and it becomes cloddy if tilled when too wet or too dry. Flooding can be controlled by levees, dikes, and pumps. Proper row arrangement, field ditches, and suitable outlets help to remove excess surface water. Land grading and smoothing also improve surface drainage, but in places large volumes of soil must be moved. Returning crop residue to the soil improves tilth and fertility.

These soils are poorly suited to urban development. They generally are not suited to use as homesites because of the hazard of flooding. Wetness, low strength for roads, very high shrink-swell potential, and very slow permeability, are severe limitations for dwellings, local roads and streets, and most sanitary facilities. Major flood-control structures and extensive local drainage systems are needed to reduce wetness and the hazard of flooding. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low shrink-swell potential. Septic tank absorption fields will not function properly in this wet and very slowly permeable soil during rainy periods. Where flooding is reduced, lagoons or self-contained disposal units can be used to dispose of sewage properly.

These soils are poorly suited to recreational uses. The main limitations are wetness, very slow permeability, the clayey surface layer, and the hazard of flooding. Good drainage can improve these soils for most recreational uses. Flooding can be reduced, but only by major structures, such as levees and water pumps.

These soils are well suited to use as habitat for wetland and woodland wildlife. Habitat for waterfowl and furbearers can be improved by constructing shallow ponds. Selectively harvesting to leave large den and mast-producing trees, such as oak and beech trees, can improve the habitat for deer, squirrel, and turkey.

These soils are in capability subclass IVw. The woodland ordination symbol is 4W for the Latanier soil and 3W for the Moreland soil.

Lo—Loring silt loam, 1 to 3 percent slopes

This gently sloping, moderately well drained soil is mainly on ridgetops on uplands. The areas of this soil range from about 20 to 300 acres.

Typically, the surface layer is brown silt loam about 6 inches thick. The next layer to a depth of about 10 inches is yellowish brown silt loam. The subsoil to a depth of about 23 inches is dark yellowish brown silt loam. Below this, to a depth of about 51 inches, is a fragipan. It is dark yellowish brown silt loam in the upper and middle parts and yellowish brown silt loam in the lower part. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam.

This soil has medium fertility and moderately high or high levels of exchangeable aluminum that are potentially toxic to crops. Water and air move through this soil at a moderate rate above the fragipan and at a slow rate in the fragipan. Water runs off the surface at a medium rate. A seasonal high water table is perched on the fragipan at a depth of about 2 to 3 feet below the soil surface during December through March. The available water capacity is moderate or high. The effective rooting depth is about 23 inches. Plant root development and the available water capacity are limited by the fragipan. The shrink-swell potential is low.

Included with this soil in mapping are a few small areas of Calhoun, Feliciana, and Olivier soils. Calhoun soils are on broad flats and in depressional areas. They are poorly drained and do not have a fragipan. Feliciana soils have more convex slopes than the Loring soil and do not have a fragipan. Olivier soils are in level areas and have gray mottles in the upper part of the subsoil. The included soils make up about 10 percent of the map unit.

This soil is used mainly as cropland or pastureland. In a few areas, it is used as homesites.

This soil is well suited to use as woodland. The potential for the production of both pine and hardwood trees is moderately high. The main concern in producing and harvesting timber is a moderate equipment use limitation caused by wetness. Competing plants can be controlled by proper site preparation and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees. Rutting and soil compaction can be reduced by harvesting only during dry periods.

This soil is well suited to pasture. Medium fertility is a minor limitation. Erosion is a hazard when the soil is tilled and until pasture plants become established. The main suitable pasture plants are common bermudagrass, improved bermudagrass, bahiagrass, ryegrass, and ball clover. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture and soil in good condition. Seedbed preparation should be on the contour or across the slope where practical. Fertilizer and lime are needed for optimum growth of grasses and legumes.

This soil is moderately well suited to cultivated crops. The main limitation is the moderate hazard of erosion, and medium fertility is a minor limitation. Soybean is the main crop; but corn, cotton, and sweet potatoes are also suitable crops. This soil is friable and easy to keep in good tilth. It can be worked throughout a wide range of moisture content. In places, irregular slopes hinder tillage operations. Plow pans develop easily, but they can be broken by deep plowing or chiseling. Limiting tillage for seedbed preparation and weed control reduces runoff and erosion. Conservation practices, such as terraces, diversions, and grassed waterways, help to prevent erosion. Drop structures placed in grassed waterways help to prevent gullying. All tillage should be on the contour or across the slope. Crop residue left on or near the surface reduces runoff and helps to maintain soil tilth and organic matter content. Most crops respond well to fertilizer and lime, which help to improve fertility and reduce the levels of exchangeable aluminum. Where water of suitable quality is available, supplemental irrigation can prevent damage to crops during dry periods.

This soil is moderately well suited to urban development. The main limitations are wetness, slow permeability, and low strength for roads. Unless internal drainage is improved, septic tank absorption fields do not function properly during rainy periods because of a seasonal high water table and slow permeability. Self-contained disposal units can be used to dispose of sewage properly. Revegetating disturbed areas around construction sites as soon as possible helps to control soil erosion. Mulching, fertilizing, and irrigating are needed to establish lawn grasses and other small-seeded plants. Roads and streets should be designed to offset the limited ability of the soil to support a load.

This soil is moderately well suited to recreational uses. The main limitations are wetness, slow permeability, and the hazard of erosion. Steepness of slope is a limitation for playgrounds. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover. The cover can be maintained by controlling traffic. Cuts and fills should be seeded or mulched.

This soil is well suited to use as habitat for openland and woodland wildlife, such as dove, quail, rabbit, deer, and turkey. Habitat for wildlife can be improved by maintaining existing plant cover or by propagating desirable plants. In pine forests, controlled burning can increase the amount of palatable browse for deer and seed-producing plants for quail and turkey.

This Loring soil is in capability subclass IIe. The woodland ordination symbol is 10A.

Lr—Loring silt loam, 3 to 8 percent slopes

This moderately sloping or strongly sloping, moderately well drained soil is on side slopes and on narrow, convex ridgetops on uplands. The areas of this soil range from 20 to several hundred acres.

Typically, the surface layer is brown silt loam about 4 inches thick. The next layer to a depth of about 10 inches is yellowish brown silt loam. The subsoil to a depth of about 18 inches is yellowish brown silt loam. The lower part of the subsoil to a depth of about 55 inches is a yellowish brown, mottled silt loam fragipan. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. In places, the soil is eroded and has a surface layer about 2 or 3 inches thick.

This soil has medium fertility and moderately high or high levels of exchangeable aluminum that are potentially toxic to crops. Water and air move through this soil at a moderate rate above the fragipan and at a slow rate in the fragipan. Water runs off the surface at a rapid rate. A seasonal high water table is perched above the fragipan at a depth of about 2 to 3 feet below the soil surface during December through March. The available water capacity is moderate or high. The effective rooting depth is about 22 inches. Plant root development and the available water capacity are limited by the fragipan. The shrink-swell potential is low.

Included with this soil in mapping are a few small areas of Feliciana soils. These soils have more convex slopes than the Loring soil and do not have a fragipan. The included soils make up about 15 percent of the map unit.

This soil is used mainly as pastureland or woodland. In a few areas, it is used as cropland.

This soil is well suited to use as woodland. The potential for the production of pine and hardwood trees is moderately high. The use of equipment is restricted somewhat by wetness, and plant competition is severe. Competing plants can be controlled by proper site preparation and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees. Rutting and soil compaction can be reduced by planting and harvesting only during the drier periods.

This soil is well suited to pasture. Erosion is a hazard when the soil is tilled and until pasture grasses become established. The main suitable pasture plants are common bermudagrass, improved bermudagrass, bahiagrass, ryegrass, and ball clover. Seedbed preparation should be on the contour or across the slope where practical. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture and soil in good condition. Fertilizer and lime are needed for optimum growth of grasses and legumes.

This soil is moderately well suited to cultivated crops. The main limitations are steepness of slope, potentially toxic levels of exchangeable aluminum, and the severe hazard of erosion. Soybean is the main crop; but sweet potatoes, cotton, corn, and vegetables are also suitable crops. In places, irregular slopes hinder tillage operations. This soil is friable and easy to keep in good tilth. It can be worked throughout a wide range of moisture content. Plow pans develop easily, but they can be broken by deep plowing or chiseling. Limiting tillage for seedbed preparation and weed control reduces runoff and erosion. Gradient terraces and contour farming reduce the risk of sheet and rill erosion on the steeper slopes. Diversions and grassed waterways also help to control erosion. Drop structures can be installed in grassed waterways to control gullying. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control gullying. Most crops respond well to fertilizer and lime, which help to improve fertility and reduce the levels of exchangeable aluminum.

This soil is moderately well suited to urban development. Wetness, steepness of slope, slow permeability, and low strength for roads and streets are the main limitations. The hazard of erosion is increased if the soil is left exposed during site development. Plans for homesite development should provide for the preservation of as many trees as possible. Revegetating disturbed areas around construction sites as soon as possible helps to control soil erosion. Establishing and maintaining plant cover can be achieved through proper fertilizing, seeding, mulching, and shaping of the slopes. During the rainy season, effluent from onsite sewage disposal systems can seep at points downslope. Absorption lines should be installed on the contour. Self-contained disposal units can be used to dispose of sewage properly. Roads and streets should be designed to offset the limited ability of the soil to support a load.

This soil is moderately well suited to recreational uses. The main limitations are wetness, slow permeability, and the hazard of erosion. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover. The cover can be maintained by fertilizing and controlling traffic. Cuts and fills should be seeded or mulched.

This soil is well suited to use as habitat for woodland and openland wildlife, such as deer, dove, quail, squirrel, rabbit, and small nongame birds. Habitat for wildlife can be improved by selectively harvesting timber to leave large den and mast-producing trees. In pine forests, controlled burning can increase the amount of palatable browse for deer and seed-producing plants for quail and dove.

This Loring soil is in capability subclass IIIe. The woodland ordination symbol is 10A.

Lt—Lytle silt loam, 1 to 3 percent slopes

This gently sloping, well drained soil is on ridgetops on uplands. The areas of this soil range from about 20 to 200 acres.

Typically, the surface layer is brown silt loam about 6 inches thick. The subsoil extends to a depth of about 70 inches. It is yellowish red silt loam and silty clay loam in the upper part, strong brown silt loam and sandy loam in the middle part, and red sandy clay loam in the lower part.

This soil has low fertility and moderately high or high levels of exchangeable aluminum in the root zone that are potentially toxic to crops. Water and air move through this soil at a moderate rate. Water runs off the surface at a medium rate. A seasonal high water table is at a depth of more than 6 feet. The available water capacity is high. The shrink-swell potential is low to a depth of 60 inches or more.

homesites because of the hazard of flooding. Seasonal wetness and soil droughtiness in summer and autumn are additional limitations. Flooding can be controlled, but only by major flood-control structures, such as levees and water pumps.

These soils are well suited to use as habitat for woodland wildlife and moderately well suited to use as habitat for openland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Selectively harvesting to preserve oak and other large mast-producing trees can improve the habitat for deer, squirrel, and turkey.

The Morganfield soil is in capability subclass IVw, and the Bigbee soil is in capability subclass IIIs. The woodland ordination symbol is 13W for the Morganfield soil and 9S for the Bigbee soil.

Oa—Olivier silt loam, 0 to 1 percent slopes

This nearly level, somewhat poorly drained soil is on broad, slightly convex ridges on terraces. Individual areas of this soil range from about 20 to 200 acres.

Typically, the surface layer is brown silt loam about 5 inches thick. The subsurface layer is light brownish gray silt loam about 5 inches thick. The subsoil to a depth of about 24 inches is light yellowish brown, mottled silt loam. The subsoil to a depth of about 60 inches is a light yellowish brown, mottled silt loam fragipan.

This soil has medium fertility and moderately high levels of exchangeable aluminum that are potentially toxic to crops. Water and air move through the fragipan at a slow rate. Water runs off the surface at a slow rate. A perched seasonal high water table ranges from about 1 foot to 2.5 feet below the soil surface during December through April. The available water capacity is high. The shrink-swell potential is moderate.

Included with this soil in mapping are a few small areas of Calhoun, Deerford, Feliciana, and Loring soils. Calhoun soils are in slightly depressional areas or along drainageways. They are poorly drained and are gray throughout the profile. Deerford soils are in positions similar to those of the Olivier soil and have high levels of exchangeable sodium in the lower part of the subsoil. Feliciana and Loring soils are in higher positions on the landscape than the Olivier soil and do not have gray mottles in the upper part of the subsoil. In addition, the Feliciana soils do not have a fragipan. The included soils make up about 10 percent of the map unit.

This soil is used mainly as woodland and pastureland. A small acreage is used as cropland or homesites.

This soil is well suited to use as woodland. The potential for the production of pine and hardwood trees is very high. The main concerns in producing and harvesting timber are a moderate equipment use limitation caused by wetness and severe competition from understory plants. After harvesting, reforestation can be carefully managed to reduce competition from undesirable understory plants. Competing vegetation can be controlled by proper site preparation and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees. Conventional methods of harvesting timber can be used except during rainy periods, generally from December to April.

This soil is well suited to pasture. The main limitations are wetness and low fertility. The main suitable pasture plants are bahiagrass, common bermudagrass, improved bermudagrass, white clover, wild winter peas, vetch, tall fescue, and ryegrass. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture and soil in good condition. Fertilizer and lime are needed for optimum growth of grasses and legumes. Excess water on the surface can be removed by field ditches and suitable outlets.

This soil is moderately well suited to cultivated crops. The main limitations are medium fertility, wetness, and potentially toxic levels of exchangeable aluminum in the root zone. The main suitable crops are soybeans, truck crops, corn, wheat, and grain sorghum (fig. 8). This soil is friable and easy to keep in good tilth. It can be worked throughout a wide range of moisture content. Proper row arrangement, field ditches, and suitable outlets help to remove excess surface water. Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or a grass-legume mixture help to maintain fertility and tilth. Crops respond well to lime and fertilizer, which help to increase soil fertility and reduce the levels of exchangeable aluminum.

This soil is poorly suited to urban development. The main limitations are wetness, low strength for roads and streets, moderate shrink-swell potential, and slow permeability. This soil has severe limitations for building sites, local roads and streets, and most sanitary facilities. Excess water can be removed by shallow ditches and by providing the proper grade. Footings and foundations of buildings can be strengthened to prevent structural damage from the shrinking and swelling of the soil. Slow permeability and a high water table increase the possibility for septic tank absorption fields to fail. Lagoons or self-contained disposal units can be used to dispose of sewage properly. Drainage can improve this soil for growing lawn grasses, shade trees, ornamental trees, shrubs, vines, and vegetable gardens.

This soil is moderately well suited to recreational uses. The main limitations are wetness and slow permeability. Good drainage can improve this soil for most recreational uses. Excess water can be removed by shallow ditches or by providing the proper grade.

Figure 8.—Winter wheat grows well in areas of Olivier silt loam, 0 to 1 percent slopes.

This soil is well suited to use as habitat for openland and woodland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. In pine forests, controlled burning can increase the amount of palatable browse for deer and seed-producing plants for quail and turkey.

This Olivier soil is in capability subclass IIw. The woodland ordination symbol is 11W.

Ob—Olivier silt loam, 1 to 3 percent slopes

This gently sloping, somewhat poorly drained soil is on low, narrow ridges and side slopes on terraces along drainageways. Individual areas of this soil range from about 10 to 100 acres.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsurface layer is light yellowish brown, mottled silt loam. The subsoil to a depth of about 26 inches is yellowish brown, mottled silt loam. Below this, to a depth of about 60 inches, is a yellowish brown silt loam fragipan. It is mottled in the upper part.

This soil has medium fertility. Permeability is slow in the fragipan. Water runs off the surface at a medium rate. Water is perched above the fragipan at a depth of 1 foot to 2.5 feet below the soil surface during December through April. The effective rooting depth is about 26 inches. The available water capacity is high. The shrink-swell potential is moderate.

Included with this soil in mapping are a few small areas of Calhoun, Deerford, Feliciana, and Loring soils. Calhoun soils are in slightly depressional areas or along drainageways. They are poorly drained and are gray throughout the profile. Deerford soils are in positions similar to those of the Olivier soil and have high levels of exchangeable sodium in the lower part of the subsoil. Feliciana and Loring soils are in higher positions on the landscape than the Olivier soil and do not have gray mottles in the upper part of the subsoil. In addition, the Feliciana soils do not have a fragipan. The included soils make up about 10 percent of the map unit.

This soil is used mainly as woodland. In a few areas, it is used as pastureland, cropland, or homesites.

This soil is well suited to use as woodland. The potential for the production of pine and hardwood trees is high. The main concerns in producing and harvesting timber are a moderate equipment use limitation caused by wetness and severe competition from understory plants. After harvesting, reforestation can be carefully managed to reduce competition from undesirable understory plants. Competing vegetation can be controlled by proper site preparation and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees. Rutting and soil compaction can be reduced by planting and harvesting during the drier seasons.

This soil is well suited to pasture (fig. 9). The main limitations are the slight hazard of erosion during the

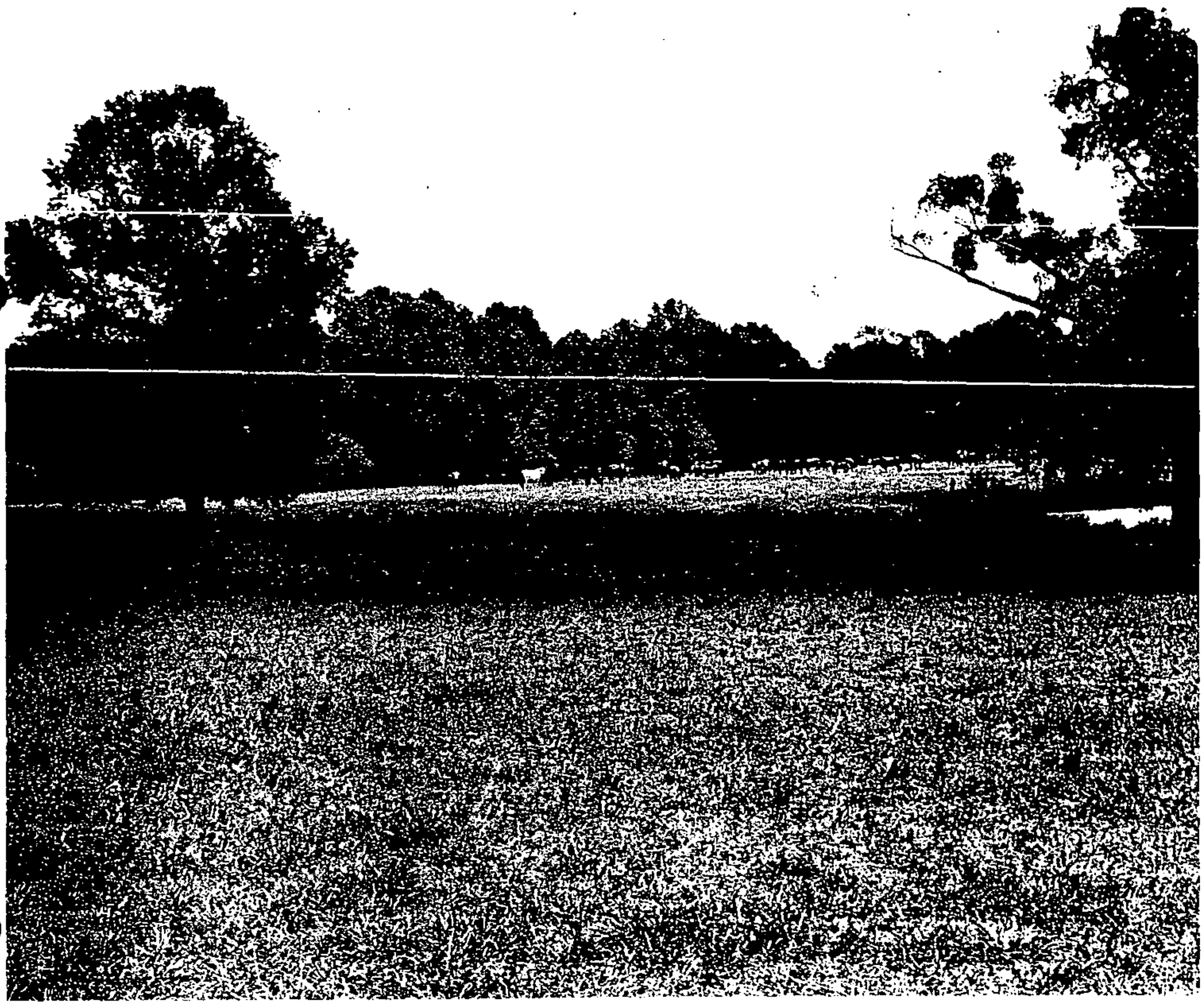


Figure 9.—A pasture of bahiagrass in an area of Olivier silt loam, 1 to 3 percent slopes.

establishment period, wetness, and medium fertility. The main suitable pasture plants are bahiagrass, common bermudagrass, improved bermudagrass, ball clover, crimson clover, arrowleaf clover, and ryegrass. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture and soil in good condition. Fertilizer and lime are needed for optimum growth of grasses and legumes.

This soil is moderately well suited to cultivated crops. The main limitations are medium fertility, wetness, potentially toxic levels of aluminum, and the slight hazard of erosion. The main suitable crops are soybeans, corn, grain sorghum, and truck crops. Seedbed preparation should be on the contour or across the slope where practical to reduce erosion. This soil is friable and easy to keep in good tilth. It can be worked throughout a wide range of moisture content. Excess water on the surface can be removed by field ditches and suitable outlets. Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or a grass-legume mixture help to reduce erosion and maintain fertility and tilth. Crops respond well to lime and fertilizer, which help to increase soil fertility and reduce the levels of exchangeable aluminum.

This soil is poorly suited to urban development. The main limitations are low strength for roads and streets, moderate shrink-swell potential, slow permeability, and wetness. A seasonal high water table is perched above the fragipan, and drainage should be provided if buildings are constructed. Preserving the existing plant cover during construction helps to control erosion. Slow permeability and a high water table increase the possibility for septic tank absorption fields to fail. Lagoons or self-contained disposal units can be used to dispose of sewage properly. Buildings and roads should be designed to offset the effects of shrinking and swelling. Establishing and maintaining plant cover can be achieved through proper fertilizing, seeding, mulching, and shaping of the slopes.

This soil is moderately well suited to recreational uses. The main limitations are wetness and slow permeability. Good drainage can improve this soil for most recreational uses. Excess water can be removed by shallow ditches or by providing the proper grade.

This soil is well suited to use as habitat for openland and woodland wildlife. Habitat for wildlife can be improved by planting appropriate vegetation, by maintaining existing plant cover, or by propagating desirable plants. Selectively harvesting to preserve oak and other mast-producing trees can improve the habitat for deer, squirrel, and turkey.

This Olivier soil is in capability subclass IIe. The woodland ordination symbol is 11W.

OG—Ouachita, Ochlockonee, and Guyton soils, frequently flooded

These gently undulating soils are on flood plains. The Ouachita and Ochlockonee soils are well drained, and the Guyton soil is poorly drained. These soils are subject to brief to long periods of flooding throughout the year, but more commonly in winter and spring. The Ouachita and Ochlockonee soils are on low ridges, and the Guyton soil is in low positions between the ridges. The areas of these soils typically are long and narrow and range to several thousand acres. They are about 35 percent Ouachita soil, about 30 percent Ochlockonee soil, and about 20 percent Guyton soil. Each of these soils can be mapped separately, but because frequent flooding limits the use and management of these soils, they were not separated in mapping. Most mapped areas contain all three soils, but some areas contain only one or two. Fewer observations were made than in other map units. The detail in mapping, however, is adequate for the expected use of the soil. Slopes range from 1 to 3 percent on the ridges. Slopes are less than 1 percent in the low positions between ridges.

The Ouachita soil has a surface layer of brown silt loam about 7 inches thick. The subsoil to a depth of about 48 inches is dark yellowish brown silt loam and silty clay loam in the upper part; yellowish brown silty clay loam in the middle part; and yellowish brown, mottled silt loam in the lower part. The substratum to a depth of about 60 inches is mottled yellowish brown and light brownish gray fine sandy loam.

This Ouachita soil has low fertility and high levels of exchangeable aluminum in the root zone that are potentially toxic to crops. Water and air move through this soil at a moderately slow rate. Water runs off the surface at a slow rate. A seasonal high water table is at a depth of more than 6 feet. The available water capacity is high or very high. The shrink-swell potential is low.

The Ochlockonee soil has a surface layer of brown fine sandy loam about 6 inches thick. The underlying material to a depth of about 60 inches is yellowish brown sandy loam in the upper part, light yellowish brown loam in the middle part, and dark yellowish brown sandy loam in the lower part.

This Ochlockonee soil has low fertility and high levels of exchangeable aluminum in the root zone that are potentially toxic to crops. Water and air move through this soil at a moderate rate. Water runs off the surface at a slow rate. A seasonal high water table is at a depth of 3 to 5 feet below the surface from December to April. The available water capacity is moderate or high. The shrink-swell potential is low.

The Guyton soil has a surface layer of dark grayish

Table 14.--Physical and Chemical Properties of the Soils

(The symbol < means less than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH				Pct
AR-------------	0-5	---	0.05-0.25	2.0-6.0	0.20-0.50	5.1-6.5	Low----------	---	---	30-90
Arat	5-12	10-32	0.25-1.00	0.6-2.0	0.18-0.23	5.1-7.3	Low----------	0.43		
	12-60	14-35	0.25-1.00	0.06-0.2	0.18-0.20	4.5-7.8	Low----------	0.37		
Bd-------------	0-11	10-27	1.40-1.60	0.6-2.0	0.21-0.24	4.5-6.0	Low----------	0.49	3	.5-2
Bude	11-27	10-32	1.40-1.65	0.06-0.2	0.14-0.23	4.5-6.0	Moderate-----	0.43		
	27-60	16-32	1.40-1.65	0.06-0.2	0.11-0.23	4.5-6.0	Moderate-----	0.37		
Ca-------------	0-20	10-27	1.30-1.65	0.2-0.6	0.21-0.23	3.6-6.0	Low----------	0.49	5	.5-5
Calhoun	20-31	22-35	1.30-1.65	0.06-0.2	0.20-0.22	3.6-7.3	Moderate-----	0.43		
	31-60	10-30	1.30-1.65	0.2-0.6	0.21-0.23	3.6-7.8	Low----------	0.43		
Cb-------------	0-12	10-27	1.30-1.65	0.2-0.6	0.21-0.23	3.6-6.0	Low----------	0.49	5	.5-5
Calhoun	12-45	22-35	1.30-1.65	0.06-0.2	0.20-0.22	3.6-7.3	Moderate-----	0.43		
	45-60	10-30	1.30-1.65	0.2-0.6	0.21-0.23	3.6-7.8	Low----------	0.43		
CC*:										
Calhoun---------	0-26	10-27	1.30-1.65	0.2-0.6	0.21-0.23	3.6-6.0	Low----------	0.49	5	.5-5
	26-38	22-35	1.30-1.65	0.06-0.2	0.20-0.22	3.6-7.3	Moderate-----	0.43		
	38-60	10-30	1.30-1.65	0.2-0.6	0.21-0.23	3.6-7.8	Low----------	0.43		
Cascilla--------	0-6	5-20	1.40-1.50	0.6-2.0	0.18-0.22	4.5-5.5	Low----------	0.43	5	1-4
	6-50	18-30	1.45-1.50	0.6-2.0	0.16-0.20	4.5-5.5	Low----------	0.43		
	50-60	5-25	1.40-1.50	0.6-2.0	0.16-0.20	4.5-5.5	Low----------	0.43		
Ce-------------	0-5	14-27	1.35-1.65	0.6-2.0	0.21-0.23	5.6-8.4	Low----------	0.43	5	.5-4
Commerce	5-31	14-39	1.35-1.65	0.2-0.6	0.20-0.22	6.1-8.4	Moderate-----	0.32		
	31-60	14-39	1.35-1.65	0.2-2.0	0.20-0.23	6.6-8.4	Low----------	0.37		
CM*------------	0-8	14-27	1.35-1.65	0.6-2.0	0.21-0.23	5.6-8.4	Low----------	0.43	5	.5-4
Commerce	8-24	14-39	1.35-1.65	0.2-0.6	0.20-0.22	6.1-8.4	Moderate-----	0.32		
	24-60	14-39	1.35-1.65	0.2-2.0	0.20-0.23	6.6-8.4	Low----------	0.37		
CN-------------	0-4	27-39	1.25-1.45	0.2-0.6	0.15-0.19	5.6-8.4	Moderate-----	0.37	5	.5-4
Commerce	4-44	14-39	1.35-1.65	0.2-0.6	0.20-0.22	6.1-8.4	Moderate-----	0.32		
	44-60	14-39	1.35-1.65	0.2-2.0	0.20-0.23	6.6-8.4	Low----------	0.37		
Co-------------	0-9	0-18	1.30-1.65	0.6-2.0	0.18-0.23	5.6-8.4	Low----------	0.43	5	.5-3
Convent	9-60	0-18	1.30-1.65	0.6-2.0	0.20-0.23	5.6-8.4	Low----------	0.37		
CR-------------	0-6	5-12	1.45-1.55	6.0-20	0.06-0.10	5.6-8.4	Low----------	0.10	5	.1-2
Crevasse	6-60	2-8	1.40-1.50	6.0-20	0.02-0.06	5.6-8.4	Low----------	0.15		
De-------------	0-10	5-27	1.30-1.70	0.6-2.0	0.21-0.23	4.5-6.5	Low----------	0.49	3	.5-4
Deerford	10-24	10-35	1.30-1.80	0.06-0.2	0.12-0.18	4.5-8.4	Moderate-----	0.49		
	24-60	10-35	1.30-1.80	0.2-0.6	0.12-0.18	6.6-8.4	Moderate-----	0.49		
Dx-------------	0-5	10-27	1.30-1.70	0.6-2.0	0.15-0.24	4.5-7.3	Low----------	0.43	5	.5-4
Dexter	5-9	10-27	1.30-1.70	0.6-2.0	0.15-0.24	4.5-6.0	Low----------	0.43		
	9-31	10-35	1.40-1.70	0.6-2.0	0.15-0.24	4.5-6.0	Low----------	0.32		
	31-60	10-30	1.30-1.70	0.6-6.0	0.08-0.18	4.5-6.0	Low----------	0.24		
FA-------------	0-5	40-95	0.80-1.45	<0.06	0.18-0.20	5.6-7.3	Very high----	0.20	5	2-15
Fausse	5-32	40-95	0.80-1.45	<0.06	0.18-0.20	5.6-7.3	Very high----	0.20		
	32-60	35-95	1.10-1.45	<0.2	0.18-0.20	6.6-8.4	Very high----	0.24		

See footnote at end of table.

Table 14.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH				Pct
Fb: Feliciana	0-5	8-22	1.30-1.50	0.6-2.0	0.20-0.23	3.6-6.0	Low	0.49	5	1-6
	5-46	20-35	1.30-1.50	0.6-2.0	0.20-0.22	4.5-6.0	Low	0.49		
	46-65	12-25	1.30-1.50	0.6-2.0	0.20-0.23	4.5-6.0	Low	0.49		
Fe: Feliciana	0-5	8-22	1.30-1.50	0.6-2.0	0.20-0.23	3.6-6.0	Low	0.49	5	1-6
	5-46	20-35	1.30-1.50	0.6-2.0	0.20-0.23	4.5-6.0	Low	0.49		
	46-65	12-25	1.30-1.50	0.6-2.0	0.20-0.23	4.5-6.0	Low	0.49		
Fg: Feliciana	0-4	8-22	1.30-1.50	0.6-2.0	0.20-0.23	3.6-6.0	Low	0.49	5	1-6
	4-50	20-35	1.30-1.50	0.6-2.0	0.20-0.22	4.5-6.0	Low	0.49		
	50-60	12-25	1.30-1.50	0.6-2.0	0.20-0.23	4.5-6.0	Low	0.49		
FH*:										
Feliciana	0-2	8-22	1.30-1.50	0.6-2.0	0.20-0.23	3.6-6.0	Low	0.49	5	1-6
	2-41	20-35	1.30-1.50	0.6-2.0	0.20-0.22	4.5-6.0	Low	0.49		
	41-60	12-25	1.30-1.50	0.6-2.0	0.20-0.23	4.5-6.0	Low	0.49		
Natchez	0-2	8-18	1.30-1.45	0.6-2.0	0.20-0.24	5.1-7.3	Low	0.49	5	.5-3
	2-41	8-18	1.30-1.45	0.6-2.0	0.20-0.24	4.5-7.3	Low	0.49		
	41-60	8-18	1.30-1.45	0.6-2.0	0.20-0.24	6.6-8.4	Low	0.49		
Fk: Fluker	0-6	2-12	1.35-1.65	0.6-2.0	0.14-0.24	3.6-6.0	Low	0.49	4	.5-4
	6-12	5-18	1.35-1.65	0.6-2.0	0.20-0.24	3.6-6.0	Low	0.49		
	12-37	18-33	1.35-1.65	0.6-2.0	0.20-0.24	3.6-6.0	Low	0.43		
	37-60	6-22	1.45-1.90	0.06-0.2	0.01-0.10	3.6-6.0	Low	0.32		
Fr: Frost, ponded	0-15	8-22	1.35-1.65	0.2-0.6	0.21-0.23	4.5-6.5	Low	0.49	5	.5-4
	15-60	18-35	1.35-1.70	0.06-0.2	0.20-0.22	4.5-8.4	Moderate	0.37		
Ke: Kenefick	0-8	5-15	1.30-1.45	2.0-6.0	0.11-0.15	4.5-6.5	Low	0.24	5	.2-2
	8-42	20-34	1.35-1.55	0.6-2.0	0.12-0.18	4.5-6.5	Moderate	0.32		
	42-58	10-24	1.50-1.65	0.6-2.0	0.12-0.17	4.5-6.0	Low	0.37		
	58-70	2-15	1.50-1.69	2.0-6.0	0.06-0.14	4.5-5.5	Low	0.24		
LA*:										
Latanier	0-4	40-55	1.20-1.45	<0.06	0.15-0.19	6.6-8.4	Very high	0.32	5	1-4
	4-27	40-55	1.20-1.45	<0.06	0.15-0.19	6.6-8.4	Very high	0.32		
	27-60	10-27	1.30-1.65	0.06-2.0	0.18-0.22	6.6-8.4	Low	0.37		
Moreland	0-10	39-50	1.20-1.50	<0.06	0.12-0.18	6.1-7.8	Very high	0.32	5	1-4
	10-60	35-60	1.20-1.70	<0.2	0.12-0.21	6.6-8.4	High	0.32		
Lo: Loring	0-10	8-18	1.30-1.50	0.6-2.0	0.20-0.23	4.5-6.0	Low	0.49	4-3	.5-2
	10-23	18-32	1.40-1.50	0.6-2.0	0.20-0.22	4.5-6.5	Low	0.43		
	23-51	15-30	1.50-1.70	0.06-0.2	0.06-0.13	4.5-6.0	Low	0.43		
	51-60	10-25	1.30-1.60	0.2-2.0	0.06-0.13	4.5-6.0	Low	0.43		
Lr: Loring	0-10	8-18	1.30-1.50	0.6-2.0	0.20-0.23	4.5-6.0	Low	0.49	4-3	.5-2
	10-18	18-32	1.40-1.50	0.6-2.0	0.20-0.22	4.5-6.5	Low	0.43		
	18-55	15-30	1.50-1.70	0.06-0.2	0.06-0.13	4.5-6.0	Low	0.43		
	55-70	10-25	1.30-1.60	0.2-2.0	0.06-0.13	4.5-6.0	Low	0.43		
Lt: Lytle	0-6	2-12	1.35-1.65	0.6-2.0	0.20-0.24	4.5-6.0	Low	0.49	3	.5-4
	6-24	18-34	1.35-1.65	0.6-2.0	0.20-0.24	4.5-6.0	Low	0.43		
	24-36	15-25	1.35-1.65	0.6-2.0	0.06-0.12	4.5-6.0	Low	0.24		
	36-70	20-55	1.35-1.70	0.6-2.0	0.12-0.17	4.5-6.0	Moderate	0.37		
Ly: Lytle	0-11	2-12	1.35-1.65	0.6-2.0	0.20-0.24	4.5-6.0	Low	0.49	3	.5-4
	11-28	18-34	1.35-1.65	0.6-2.0	0.20-0.24	4.5-6.0	Low	0.43		
	28-38	15-25	1.35-1.65	0.6-2.0	0.06-0.12	4.5-6.0	Low	0.24		
	38-81	20-55	1.35-1.70	0.6-2.0	0.12-0.17	4.5-6.0	Moderate	0.37		

See footnote at end of table.

Table 14.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH				Pct
MB*:										
Morganfield-----	0-4	2-5	1.40-1.50	0.6-2.0	0.20-0.23	5.6-7.8	Low-----------	0.43	5	1-3
	4-60	5-18	1.40-1.55	0.6-2.0	0.20-0.23	5.6-7.8	Low-----------	0.43		
Bigbee----------	0-36	4-10	1.40-1.50	6.0-20	0.05-0.10	4.5-6.0	Low-----------	0.10	5	.5-2
	36-60	1-10	1.40-1.50	6.0-20	0.05-0.08	4.5-6.0	Low-----------	0.17		
Oa--------------- Olivier	0-10	8-18	1.35-1.65	0.6-2.0	0.21-0.23	4.5-6.5	Low-----------	0.49	4	.5-4
	10-24	18-35	1.35-1.65	0.2-0.6	0.20-0.22	4.5-5.5	Moderate------	0.43		
	24-60	14-27	1.40-1.80	0.06-0.2	0.11-0.15	4.5-6.0	Low-----------	0.43		
Ob--------------- Olivier	0-12	8-18	1.35-1.65	0.6-2.0	0.21-0.23	4.5-6.5	Low-----------	0.49	4	.5-4
	12-26	18-35	1.35-1.65	0.2-0.6	0.20-0.22	4.5-5.5	Moderate------	0.43		
	26-60	14-27	1.40-1.80	0.06-0.2	0.11-0.15	4.5-6.0	Low-----------	0.43		
OG*:										
Ouachita--------	0-7	8-25	1.35-1.60	0.6-2.0	0.15-0.22	3.6-6.0	Low-----------	0.37	5	1-4
	7-40	18-35	1.35-1.60	0.2-0.6	0.15-0.22	3.6-5.5	Low-----------	0.32		
	40-60	8-25	1.35-1.65	0.6-6.0	0.07-0.22	4.5-5.5	Low-----------	0.24		
Ochlockonee-----	0-6	3-18	1.40-1.60	2.0-6.0	0.07-0.14	3.6-5.5	Low-----------	0.20	5	.5-2
	6-42	8-18	1.40-1.60	0.6-2.0	0.10-0.20	3.6-5.5	Low-----------	0.20		
	42-60	3-18	1.40-1.70	2.0-6.0	0.06-0.12	3.6-5.5	Low-----------	0.17		
Guyton----------	0-25	7-25	1.35-1.65	0.6-2.0	0.20-0.23	3.6-6.0	Low-----------	0.43	5	.5-4
	25-35	20-35	1.35-1.70	0.06-0.2	0.15-0.22	3.6-6.0	Low-----------	0.37		
	35-65	20-35	1.35-1.70	0.06-0.2	0.15-0.22	3.6-8.4	Low-----------	0.37		
PA*:										
Pits------------	0-60	---	---	---	---	---	-------------	---	---	---
Arents----------	0-60	---	---	---	---	---	-------------	---	---	---
RA*-------------- Riverwash	0-80	2-5	1.50-1.60	2.0-20	0.02-0.05	4.5-6.0	Low-----------	0.10	5	<.5
RC*:										
Robinsonville---	0-7	2-10	1.40-1.50	2.0-6.0	0.15-0.18	6.1-8.4	Low-----------	0.28	5	.5-2
	7-60	5-15	1.50-1.60	0.6-6.0	0.14-0.18	6.1-8.4	Low-----------	0.32		
Convent---------	0-4	0-18	1.30-1.65	0.6-2.0	0.18-0.23	5.6-8.4	Low-----------	0.43	5	.5-3
	4-60	0-18	1.30-1.65	0.6-2.0	0.20-0.23	5.6-8.4	Low-----------	0.37		
Rs--------------- Ruston	0-4	2-20	1.30-1.70	0.6-2.0	0.09-0.16	3.6-6.5	Low-----------	0.28	5	.5-6
	4-35	18-35	1.40-1.70	0.6-2.0	0.12-0.17	4.5-6.0	Low-----------	0.28		
	35-45	10-20	1.30-1.70	0.6-2.0	0.12-0.15	4.5-6.0	Low-----------	0.28		
	45-60	15-38	1.40-1.70	0.6-2.0	0.12-0.17	4.5-6.0	Low-----------	0.28		
Sa--------------- Sharkey	0-9	40-60	1.20-1.50	<0.06	0.07-0.14	5.1-8.4	Very high----	0.32	5	.5-4
	9-42	60-90	1.20-1.50	<0.06	0.07-0.14	5.6-8.4	Very high----	0.28		
	42-60	25-90	1.20-1.70	0.06-0.2	0.12-0.22	5.6-8.4	High----------	0.28		
SH--------------- Sharkey	0-6	40-60	1.20-1.50	<0.06	0.12-0.18	5.1-8.4	Very high----	0.32	5	.5-4
	6-45	60-90	1.20-1.50	<0.06	0.07-0.14	5.1-8.4	Very high----	0.28		
	45-60	25-90	1.20-1.65	0.06-0.2	0.12-0.18	5.6-8.4	High----------	0.28		
SM--------------- Smithdale	0-8	2-15	1.40-1.50	2.0-6.0	0.14-0.16	4.5-5.5	Low-----------	0.28	5	.5-2
	8-44	18-33	1.40-1.55	0.6-2.0	0.15-0.17	4.5-5.5	Low-----------	0.24		
	44-60	12-27	1.40-1.55	2.0-6.0	0.14-0.16	4.5-5.5	Low-----------	0.28		

See footnote at end of table.

Table 14.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH				Pct
Ta--------------- Tangi	0-5	2-12	1.35-1.65	0.6-2.0	0.20-0.24	4.5-6.0	Low-----------	0.49	4	.5-4
	5-20	18-30	1.35-1.65	0.6-2.0	0.20-0.24	4.5-6.0	Low-----------	0.43		
	20-58	20-35	1.45-1.85	0.06-0.2	0.08-0.14	3.6-6.0	Low-----------	0.32		
	58-80	35-55	1.40-1.80	<0.06	0.08-0.14	3.6-6.0	Moderate------	0.28		
Tg--------------- Tangi	0-4	2-12	1.35-1.65	0.6-2.0	0.20-0.24	4.5-6.0	Low-----------	0.49	4	.5-4
	4-19	18-30	1.35-1.65	0.6-2.0	0.20-0.24	4.5-6.0	Low-----------	0.43		
	19-55	20-35	1.45-1.85	0.06-0.2	0.08-0.14	3.6-6.0	Low-----------	0.32		
	55-60	35-55	1.40-1.80	<0.06	0.08-0.14	3.6-6.0	Moderate------	0.28		
To--------------- Toula	0-7	2-12	1.35-1.65	0.6-2.0	0.22-0.25	4.5-6.0	Low-----------	0.49	3	.5-4
	7-27	12-30	1.35-1.65	0.6-2.0	0.14-0.24	4.5-6.0	Low-----------	0.43		
	27-50	18-35	1.45-1.85	0.06-0.2	0.08-0.12	4.5-6.0	Low-----------	0.37		
	50-65	12-35	1.35-1.85	0.6-2.0	0.11-0.23	4.5-6.0	Low-----------	0.37		
Ts*:										
Tunica----------	0-6	40-75	1.45-1.55	<0.06	0.15-0.20	5.1-7.8	High----------	0.32	5	1-4
	6-26	40-75	1.45-1.55	<0.06	0.15-0.20	5.6-7.8	High----------	0.32		
	26-60	10-32	1.40-1.50	0.06-2.0	0.10-0.22	5.6-8.4	Low-----------	0.32		
Sharkey---------	0-7	40-60	1.20-1.50	<0.06	0.12-0.18	5.1-8.4	Very high-----	0.32	5	.5-4
	7-43	60-90	1.20-1.50	<0.06	0.07-0.14	5.1-8.4	Very high-----	0.28		
	43-60	25-90	1.20-1.65	0.06-0.2	0.12-0.18	6.6-8.4	High----------	0.28		
TU*:										
Tunica----------	0-11	40-75	1.45-1.55	<0.06	0.15-0.20	5.1-7.8	High----------	0.32	5	1-4
	11-33	40-75	1.45-1.55	<0.06	0.15-0.20	5.6-7.8	High----------	0.32		
	33-60	10-32	1.40-1.50	0.06-2.0	0.10-0.22	5.6-8.4	Low-----------	0.32		
Sharkey---------	0-6	40-60	1.20-1.50	<0.06	0.12-0.18	5.1-8.4	Very high-----	0.32	5	.5-4
	6-36	60-90	1.20-1.50	<0.06	0.07-0.14	5.1-8.4	Very high-----	0.28		
	36-60	25-90	1.20-1.65	0.06-0.2	0.12-0.18	6.6-8.4	High----------	0.28		
UB*-------------- Urban land	0-6	---	---	---	---	---	-------------	---	---	---
We--------------- Weyanoke	0-3	12-18	1.40-1.50	0.6-2.0	0.20-0.22	5.6-7.8	Low-----------	0.43	5	.5-2
	3-27	5-15	1.45-1.70	0.2-0.6	0.14-0.23	5.6-7.8	Low-----------	0.43		
	27-60	5-25	1.45-1.70	0.2-0.6	0.14-0.23	5.6-7.8	Low-----------	0.43		

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 15.--Soil and Water Features

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft				
AR----------------- Arat	D	Frequent----	Very long	Jan-Dec	+3-0.5	Apparent	Jan-Dec	High-----	Moderate.
Bd----------------- Bude.	C	None--------	---	---	0.5-1.5	Perched	Jan-Apr	High-----	High.
Ca----------------- Calhoun	D	Rare--------	---	---	0-1.5	Perched	Dec-Apr	High-----	Moderate.
Cb----------------- Calhoun	D	Occasional	Brief to long.	Dec-Jun	0-1.5	Perched	Dec-Apr	High-----	Moderate.
CC*:									
Calhoun----------	D	Frequent----	Brief-----	Dec-Jun	0-1.5	Perched	Dec-Apr	High-----	Moderate.
Cascilla---------	B	Frequent----	Brief-----	Jan-Apr	>6.0	---	---	Low------	Moderate.
Ce----------------- Commerce	C	None--------	---	---	1.5-4.0	Apparent	Dec-Apr	High-----	Low.
CM*---------------- Commerce	C	Occasional	Brief to long.	Dec-Jun	1.5-4.0	Apparent	Dec-Apr	High-----	Low.
CN----------------- Commerce	C	Frequent----	Brief to long.	Dec-Jun	1.5-4.0	Apparent	Dec-Apr	High-----	Low.
Co----------------- Convent	C	None--------	---	---	1.5-4.0	Apparent	Dec-Apr	High-----	Low.
CR----------------- Crevasse	A	Frequent----	Brief-----	Oct-Mar	3.5-6.0	Apparent	Nov-Mar	Low------	Moderate.
De----------------- Deerford	D	Rare--------	---	---	0.5-1.5	Perched	Dec-Apr	High-----	Moderate.
Dx----------------- Dexter	B	None--------	---	---	>6.0	---	---	Moderate	Moderate.
FA----------------- Fausse	D	Frequent----	Very long	Jan-Dec	+1.-1.5	Apparent	Jan-Dec	High-----	Low.
Fb, Fe, Fg-------- Feliciana	B	None--------	---	---	>6.0	---	---	Moderate	Moderate.
FH*:									
Feliciana--------	B	None--------	---	---	>6.0	---	---	Moderate	Moderate.
Natchez----------	B	None--------	---	---	>6.0	---	---	Low------	Low.
Fk----------------- Fluker	C	Rare--------	---	---	0.5-1.5	Perched	Dec-Apr	High-----	High.
Fr----------------- Frost, ponded	D	Frequent----	Very long	Jan-Dec	+2-0	Apparent	Jan-Dec	High-----	Moderate.

See footnote at end of table.

Table 15.--Soil and Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft				
Ke: Kenefick	B	None	---	---	>6.0	---	---	Moderate	High.
LA*:									
Latanier	D	Occasional	Brief to long.	Nov-Jul	1.0-3.0	Apparent	Dec-Apr	High	Low.
Moreland	D	Occasional	Brief to long.	Dec-Jun	0-1.5	Perched	Dec-Apr	High	Low.
Lo, Lr: Loring	C	None	---	---	2.0-3.0	Perched	Dec-Mar	Moderate	Moderate.
Lt, Ly: Lytle	B	None	---	---	>6.0	---	---	Moderate	Moderate.
MB*:									
Morganfield	B	Frequent	Brief	Jan-Apr	3.0-4.0	Apparent	Jan-Apr	Low	Low.
Bigbee	A	Frequent	Brief	Jan-Mar	3.5-6.0	Apparent	Jan-Mar	Low	Moderate.
Oa, Ob: Olivier	C	None	---	---	1.0-2.5	Perched	Dec-Apr	High	Moderate.
OG*:									
Ouachita	C	Frequent	Brief to long.	Dec-May	>6.0	---	---	Moderate	Moderate.
Ochlockonee	B	Frequent	Brief to long.	Dec-Apr	3.0-5.0	Perched	Dec-Apr	Low	High.
Guyton	D	Frequent	Brief to long.	Jan-Dec	0-1.5	Perched	Dec-May	High	High.
PA*:									
Pits	-	None	---	---	>6.0	---	---	---	---
Arents	C	None	---	---	>6.0	---	---	---	---
RA*: Riverwash	A	Frequent	Brief	Jan-Dec	0.5-6.0	Apparent	Nov-Apr	High	Low.
RC*:									
Robinsonville	B	Occasional	Brief to long.	Jan-Apr	4.0-6.0	Apparent	Jan-Apr	Low	Low.
Convent	C	Occasional	Brief to long.	Dec-Jun	1.5-4.0	Apparent	Dec-Apr	High	Low.
Rs: Ruston	B	None	---	---	>6.0	---	---	Moderate	Moderate.
Sa: Sharkey	D	Rare	---	---	0-2.0	Apparent	Dec-Apr	High	Moderate.
SH: Sharkey	D	Frequent	Brief to very long.	Dec-Jul	0-2.0	Apparent	Dec-Apr	High	Moderate.
SM: Smithdale	B	None	---	---	>6.0	---	---	Low	Moderate.

See footnote at end of table.

Table 15.--Soil and Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft				
Ta, Tg----------- Tangi	C	None--------	---	---	1.5-3.0	Perched	Dec-Apr	Moderate	Moderate.
To--------------- Toula	C	None--------	---	---	1.5-3.0	Perched	Dec-Apr	Moderate	Moderate.
Ts*:									
Tunica-----------	D	None--------	---	---	1.5-3.0	Apparent	Jan-Apr	High-----	Low.
Sharkey----------	D	None--------	---	Dec-Jul	0-2.0	Apparent	Dec-Apr	High-----	Moderate.
TU*:									
Tunica-----------	D	Frequent----	Brief to very long.	Jan-Apr	1.5-3.0	Apparent	Jan-Apr	High-----	Low.
Sharkey----------	D	Frequent----	Brief to very long.	Dec-Jul	0-2.0	Apparent	Dec-Apr	High-----	Moderate.
UB*-------------- Urban land	---	None--------	---	---	>2.0	---	---	---	---
We--------------- Weyanoke	C	Rare--------	---	---	2.5-4.0	Apparent	Jan-Apr	Low------	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

Table 16.--Fertility Test Data for Selected Soils

(Analyses by the Soil Fertility Laboratory, Louisiana Agricultural Experiment Station. Dashes indicate data is not available.)

Soil name and sample number	Horizon	Depth	Organic matter content	pH 1:1 H_2O	Extractable phosphorus	Exchangeable cations: Ca	Mg	K	Na	Al	H	Total acidity	Cation-exchange capacity (sum)	Cation-exchange capacity (effective)	Base saturation (sum)	Saturation: Sum of cation-exchange capacity Na	Saturation: Effective cation-exchange capacity Al	Ca/Mg
		In	Pct		Ppm	--Milliequivalents/100 grams of soil--									Pct	Pct	Pct	
Bude silt loam:[1]																		
(S89LA-037-58)	A	0-5	0.63	4.8	15	0.7	0.3	0.1	0.1	1.6	0.6	13.8	15.0	3.4	8.0	0.7	47.1	2.3
	E	5-11	0.41	4.8	10	0.3	0.8	0.1	0.1	3.0	0.6	12.0	13.3	4.9	9.8	0.8	61.2	0.4
	Bw1	11-15	0.12	4.9	8	0.3	1.3	0.1	0.1	5.0	0.4	14.4	16.2	7.2	11.1	0.6	69.4	0.2
	Bw2	15-20	0.09	5.1	8	0.3	2.0	0.1	0.3	6.6	0.2	13.8	16.5	9.5	16.4	1.8	69.5	0.2
	E/Bx	20-24	0.08	5.3	9	0.4	3.0	0.2	0.6	7.0	0.4	15.6	19.8	11.6	21.2	3.0	60.3	0.1
	Btx1	24-27	0.40	5.4	10	0.5	3.9	0.2	0.8	7.8	0.0	16.2	21.6	13.2	25.0	3.7	59.1	0.1
	2Btx2	27-44	0.03	5.3	10	0.6	4.1	0.2	0.8	5.8	0.2	14.4	20.1	11.7	28.4	4.0	49.6	0.1
	2Btx3	44-60	0.42	6.0	8	1.7	4.0	0.1	0.9	4.4	0.6	10.2	16.9	11.7	39.6	5.3	37.6	0.4
	---	---	---	---	---	---	---	---	---	---	---	---	---	---	41.6[2]	---	---	---
Calhoun silt loam:[1]																		
(S89LA-037-50)	Ap	0-7	1.30	4.9	56	3.4	1.2	0.2	0.1	0.6	0.4	13.2	18.1	5.9	27.1	0.6	10.2	2.8
	Eg1	7-13	0.51	5.1	123	3.1	0.9	0.1	0.2	0.6	0.4	12.0	16.3	5.3	26.4	1.2	11.3	3.4
	Eg2	13-20	0.42	5.0	108	3.6	1.3	0.1	0.3	1.6	0.2	11.9	17.2	7.1	30.8	1.7	22.5	2.8
	Eg/Btg	20-25	0.37	4.9	116	3.2	1.3	0.1	0.3	2.4	0.6	12.0	16.9	7.9	29.0	1.8	30.5	2.5
	Btg/Eg	25-31	0.30	4.8	106	3.8	1.8	0.2	0.5	4.2	0.6	11.4	17.7	11.1	35.6	2.8	37.8	2.1
	Btg1	31-41	0.28	5.1	25	3.3	2.1	0.2	0.6	4.8	0.2	16.2	22.4	11.2	27.7	2.7	42.9	1.6
	Btg2	41-52	0.24	4.7	209	4.6	3.2	0.3	1.0	5.4	0.2	17.4	26.5	14.7	34.3	3.8	36.7	1.4
	BCg	52-60	0.20	4.8	215	5.5	4.3	0.3	1.3	3.6	0.4	15.0	26.4	15.4	43.2	4.9	23.4	1.3
	---	---	---	---	---	---	---	---	---	---	---	---	---	---	43.4[2]	---	---	---
Calhoun silt loam:[3]																		
(S89LA-037-97)	A	0-3	4.84	4.7	42	3.7	1.4	0.3	0.0	1.0	1.2	10.8	16.2	7.6	33.3	0.0	13.2	2.6
	Eg	3-26	0.70	4.8	13	1.7	0.8	0.1	0.1	2.4	2.0	7.8	10.5	7.1	25.7	1.0	33.8	2.1
	Btg/Eg	26-38	0.28	5.0	10	2.0	1.8	0.1	0.5	5.2	0.6	10.2	14.6	10.2	30.1	3.4	51.0	1.1
	Btg	38-60	0.24	4.8	13	3.2	3.4	0.2	1.3	5.8	1.2	10.8	18.9	15.1	42.9	6.9	38.4	0.9
	---	---	---	---	---	---	---	---	---	---	---	---	---	---	66.7[2]	---	---	---
Cascilla silt loam:[1]																		
(S91LA-037-100)	A	0-6	3.48	4.5	42	1.9	0.7	0.2	0.1	4.4	0.6	23.7	26.6	7.9	10.9	0.4	55.7	2.7
	Bw1	6-19	1.21	4.6	61	0.7	0.3	0.1	0.1	5.2	0.8	19.2	20.4	7.2	5.9	0.5	72.2	2.3
	Bw2	19-40	0.70	4.6	51	0.5	0.5	0.1	0.1	5.4	0.4	17.8	19.0	7.0	6.3	0.5	77.1	1.0
	Bw3	40-50	0.14	5.2	29	0.1	0.7	0.1	0.2	5.6	0.8	17.0	18.1	7.5	6.1	1.1	74.7	0.1
	BC	50-60	0.18	4.9	42	0.3	0.5	0.1	0.1	4.0	0.8	14.8	15.8	5.8	6.3	0.6	69.0	0.6
Commerce silt loam:[1]																		
(S91LA-125-7)	Ap	0-5	1.42	5.4	210	8.2	2.7	0.5	0.0	0.0	0.4	11.1	22.5	11.8	50.7	0.0	0.0	3.0
	Bw1	5-21	0.62	6.9	188	12.3	3.9	0.3	0.1	0.0	0.6	9.6	26.2	17.2	63.4	0.4	0.0	3.2
	Bw2	21-31	0.35	7.6	176	11.2	3.5	0.3	0.1	0.0	0.6	12.6	27.7	15.7	54.5	0.4	0.0	3.2
	C	31-60	0.37	7.8	216	12.1	3.7	0.3	0.1	0.0	1.0	10.4	26.6	17.2	60.9	0.4	0.0	3.3

See footnotes at end of table.

Table 16.--Fertility [illegible]a for Selected Soils--Continued

Soil name and sample number	Horizon	Depth	Organic matter content	pH 1:1 H_2O	Extractable phosphorus	Exchangeable cations: Ca	Mg	K	Na	Al	H	Total acidity	Cation-exchange capacity (sum)	Cation-exchange capacity (effective)	Base saturation (sum)	Saturation: Sum of cation-exchange capacity Na	Effective cation-exchange capacity Al	Ca/Mg
		In	Pct		Ppm	----------Milliequivalents/100 grams of soil----------									Pct	Pct	Pct	
Convent silt loam:[1] (S91LA-125-9)	Ap1	0-4	2.89	7.0	610	11.3	2.9	1.1	0.1	0.0	0.6	10.4	25.8	16.0	59.7	0.4	0.0	3.9
	Ap2	4-9	0.79	7.4	307	8.8	3.0	0.9	0.0	0.0	0.4	11.8	24.8	13.1	51.8	0.0	0.0	2.9
	C1	9-19	0.51	7.8	218	9.5	3.6	0.6	0.1	0.0	0.2	11.7	25.5	14.0	54.1	0.4	0.0	2.6
	C2	19-32	0.44	8.1	201	10.6	4.2	0.3	0.2	0.0	0.2	10.7	26.0	15.5	58.8	0.8	0.0	2.5
	C3	32-60	0.35	8.1	212	9.6	4.1	0.3	0.3	0.0	0.2	9.6	23.9	14.5	59.8	1.3	0.0	2.3
Crevasse loamy sand:[1] (S91LA-125-1)	A	0-6	0.18	7.9	124	5.5	1.1	0.1	0.0	0.0	0.6	3.7	10.4	7.3	64.4	0.0	0.0	5.0
	C1	6-40	0.19	7.7	131	3.9	0.9	0.1	0.0	0.0	0.6	3.7	8.6	5.5	57.0	0.0	0.0	4.3
Deerford silt loam:[1] (S89LA-037-90)	Ap	0-6	0.98	5.5	70	3.9	1.0	0.1	0.1	0.0	0.1	4.8	9.9	5.2	51.5	1.0	0.0	3.9
	E	6-10	0.73	5.9	581	3.9	1.0	0.1	0.2	---	---	4.2	9.4	---	55.3	2.1	---	3.9
	Bt/E	10-16	0.85	6.0	590	5.9	4.5	0.2	1.5	---	---	6.0	18.1	---	66.9	8.3	---	1.3
	Btn1	16-24	0.60	5.9	572	4.9	5.1	0.3	1.9	---	---	5.9	18.1	---	67.4	10.5	---	1.0
	Btn2	24-34	0.46	6.0	513	4.7	5.1	0.2	2.1	---	---	5.8	17.9	---	67.6	11.7	---	0.9
	Btn3	34-60	0.35	6.6	470	4.4	4.0	0.2	2.7	---	---	4.8	16.1	---	70.2	16.8	---	1.1
	---	---	---	---	---	---	---	---	---	---	---	---	---	---	74.5[2]	---	---	---
Deerford silt loam:[4] (S89LA-037-54)	A	0-5	1.78	7.0	34	12.8	0.7	0.2	0.0	0.0	0.2	8.3	22.0	13.9	62.3	0.0	0.0	18.3
	E	5-10	0.70	7.7	30	5.7	1.4	0.1	0.0	0.0	0.2	15.0	22.2	7.4	32.4	0.0	0.0	4.1
	Btn1	10-24	0.60	7.5	25	8.0	1.9	0.4	0.1	0.0	0.2	9.6	20.0	10.6	52.0	0.5	0.0	4.2
	Btn2	24-30	0.58	7.5	71	9.5	4.6	0.6	0.4	0.0	0.4	9.6	24.7	15.5	61.1	1.6	0.0	2.1
	Btn3	30-42	0.12	7.6	49	6.1	5.9	0.3	1.0	0.0	0.4	9.0	22.3	13.7	59.6	4.5	0.0	1.0
	BCn	42-60	0.10	7.6	40	4.5	4.8	0.2	1.6	0.0	0.4	8.4	19.5	11.5	56.9	8.2	0.0	0.9
	---	---	---	---	---	---	---	---	---	---	---	---	---	---	52.4[2]	---	---	---
Dexter very fine sandy loam:[5] (S89LA-037-5)	Ap	0-4	1.06	5.7	249	3.5	0.7	0.5	0.0	0.0	0.6	4.8	9.5	5.3	49.5	0.0	0.0	5.0
	BA	4-6	0.72	6.2	179	4.1	0.9	0.4	0.0	0.0	0.6	4.7	10.1	6.0	53.5	0.0	0.0	4.6
	Bt1	6-15	0.30	5.1	99	3.7	1.5	0.4	0.0	0.6	0.6	9.0	14.6	6.8	38.4	0.0	8.8	2.5
	Bt2	15-28	0.23	5.0	125	3.5	2.1	0.4	0.0	1.6	0.4	8.9	14.9	8.0	40.3	0.0	20.0	1.7
	2BC1	28-37	0.23	5.0	142	2.5	2.9	0.3	0.1	2.0	0.4	9.6	15.4	8.2	37.7	0.6	24.4	0.9
	2BC2	37-47	0.11	5.0	130	1.5	1.9	0.2	0.0	2.0	0.6	7.8	11.4	6.2	31.6	0.0	32.3	0.8
	2C	47-60	0.01	5.1	107	0.9	1.2	0.1	0.0	1.0	0.4	7.2	9.4	3.6	23.4	0.0	27.8	0.7
	---	---	---	---	---	---	---	---	---	---	---	---	---	---	38.5[2]	---	---	---

See footnotes at end of table.

Table 16.--Fertility Test D[illegible] Selected Soils--Continued

Soil name and sample number	Horizon	Depth	Organic matter content	pH 1:1 H_2O	Extractable phosphorus	Exchangeable cations: Ca	Mg	K	Na	Al	H	Total acidity	Cation-exchange capacity (sum)	Cation-exchange capacity (effective)	Base saturation (sum)	Saturation: Sum of cation-exchange capacity Na	Saturation: Effective cation-exchange capacity Al	Ca/Mg
		In	Pct		Ppm	----------Milliequivalents/100 grams of soil----------									Pct	Pct	Pct	
Feliciana silt loam:[1] (S89LA-037-46)	Ap	0-5	1.82	4.1	379	1.1	0.3	0.2	0.0	1.0	0.8	7.8	9.4	3.4	17.0	0.0	29.4	3.7
	Bt1	5-15	0.46	5.2	111	3.0	0.8	0.2	0.0	0.0	1.2	5.4	9.4	5.2	42.6	0.0	0.0	3.8
	Bt2	15-29	0.19	5.5	235	6.2	3.0	0.4	0.1	0.0	0.2	12.0	21.7	9.9	44.7	0.5	0.0	2.1
	Bt3	29-46	0.25	5.6	221	6.3	3.1	0.4	0.1	0.2	0.4	11.9	21.8	10.5	45.4	0.5	1.9	2.0
	BC	46-65	0.11	5.3	174	5.5	3.0	0.3	0.1	0.8	0.4	13.2	22.1	10.1	40.3	0.5	7.9	1.8
	---	---	---	---	---	---	---	---	---	---	---	---	---	---	51.9[2]	---	---	---
Feliciana silt loam:[6] (S89LA-037-66)	Ap	0-4	2.43	3.5	417	0.6	0.3	0.2	0.0	2.0	0.4	6.0	7.1	3.5	15.5	0.0	57.1	2.0
	Bt1	4-24	0.50	4.7	118	2.5	1.8	0.2	0.1	1.8	0.2	5.4	10.0	6.6	46.0	1.0	27.3	1.4
	Bt2	24-38	0.47	5.2	153	4.3	2.8	0.3	0.2	1.8	0.6	14.4	22.0	10.0	34.5	0.9	18.0	1.5
	Bt3	38-50	0.12	5.1	99	3.4	2.4	0.2	0.2	1.6	0.4	13.6	9.8	8.2	63.3	2.0	19.5	1.4
	BC	50-60	0.05	5.4	70	3.5	2.3	0.2	0.2	1.6	0.4	12.6	18.8	8.2	33.0	1.1	19.5	1.5
	---	---	---	---	---	---	---	---	---	---	---	---	---	---	36.6[2]	---	---	---
Feliciana silt loam:[7] (S89LA-037-70)	A	0-1	5.58	4.5	178	3.0	2.0	0.9	0.1	0.0	0.4	10.8	16.8	6.4	35.7	0.6	0.0	1.5
	Bt1	1-22	0.96	4.6	97	0.9	1.1	0.2	0.0	3.0	0.4	4.8	7.0	5.6	31.4	0.0	53.6	0.8
	Bt2	22-41	0.46	4.7	79	0.7	2.5	0.2	0.1	5.6	0.2	7.8	11.3	9.3	31.0	0.9	60.2	0.3
	Bt3	41-56	0.20	4.8	70	0.4	2.2	0.2	0.1	4.6	1.0	7.7	10.6	8.5	27.4	0.9	54.1	0.2
	BC	56-60	0.14	4.5	59	0.2	1.0	0.1	0.0	1.8	0.4	3.0	4.3	3.5	30.2	0.0	54.4	0.2
	---	---	---	---	---	---	---	---	---	---	---	---	---	---	17.4[2]	---	---	---
Fluker silt loam:[1] (S89LA-037-62)	Ap	0-6	1.87	4.5	50	1.0	0.2	0.1	0.1	2.0	0.6	8.5	9.9	4.0	14.1	1.0	50.0	5.0
	BE	6-12	0.16	5.3	48	0.6	0.8	0.1	0.1	3.0	0.6	12.6	14.2	5.2	11.3	0.7	57.7	0.8
	Bt1	12-20	0.19	5.6	32	0.0	1.0	0.1	0.5	4.4	0.6	14.4	16.0	6.6	10.2	3.1	66.3	0.0
	Bt2	20-25	0.14	5.4	47	0.2	1.2	0.1	0.9	5.8	0.2	8.4	10.8	8.4	22.2	8.3	69.0	0.2
	Bt/E	25-31	0.14	5.7	38	0.2	1.6	0.1	0.8	5.0	0.6	11.4	14.1	8.3	19.1	5.7	60.2	0.1
	2Btx1	31-37	0.10	5.3	49	0.2	2.4	0.2	1.0	6.8	0.2	9.6	13.4	10.8	28.4	7.5	63.0	0.1
	2Btx2	37-49	0.01	5.1	41	0.1	1.7	0.1	1.1	4.0	0.4	7.8	10.8	7.4	27.8	10.2	54.1	0.1
	2Btx3	49-60	0.07	4.9	27	0.1	1.3	0.0	1.0	2.2	0.6	8.4	10.8	5.2	22.2	9.3	42.3	0.1
	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	14.6[2]	---	---
Frost silt loam:[1] (S91LA-125-11)	A	0-4	2.96	4.9	287	3.3	0.8	0.5	0.0	0.4	1.4	22.9	27.5	6.4	16.7	0.0	6.2	4.1
	Eg	4-15	1.73	5.0	240	2.5	0.7	0.4	0.1	0.4	1.0	18.5	22.2	5.1	16.7	0.5	7.8	3.6
	Btg/Eg	15-21	0.83	5.0	178	2.3	0.7	0.3	0.0	0.6	0.4	16.3	19.6	4.3	16.8	0.0	14.0	3.3
	Btg1	21-34	0.43	5.1	105	1.7	0.5	0.2	0.1	0.0	0.8	17.8	20.3	3.3	12.3	0.5	0.0	3.4
	Btg2	34-58	0.72	5.0	209	2.3	0.8	0.3	0.1	0.6	1.2	18.5	22.0	5.3	15.9	0.5	11.3	2.9
	BCg	58-60	0.25	5.5	229	3.1	2.1	0.2	0.3	0.4	0.4	17.8	23.5	6.5	24.3	1.3	6.2	1.5
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See footnotes at end of table.

Table 16.--Fertility T[illegible]a for Selected Soils--Continued

Soil name and sample number	Horizon	Depth	Organic matter content	pH 1:1 H_2O	Extractable phosphorus	Exchangeable cations: Ca	Mg	K	Na	Al	H	Total acidity	Cation-exchange capacity (sum)	Cation-exchange capacity (effective)	Base saturation (sum)	Saturation: Sum of cation-exchange capacity Na	Effective cation-exchange capacity Al	Ca/Mg
		In	Pct		Ppm	----------Milliequivalents/100 grams of soil----------									Pct	Pct	Pct	
Guyton silt loam:[8]																		
(S89LA-037-94)	A	0-3	1.19	4.5	63	1.4	0.6	0.1	0.1	1.6	0.8	5.4	7.6	4.6	28.9	1.3	34.8	2.3
	Eg	3-14	0.62	4.5	39	0.9	0.5	0.1	0.1	1.6	0.6	4.2	5.8	3.8	27.6	1.7	42.1	1.8
	Eg/Btg	14-20	0.61	4.5	34	0.9	0.4	0.1	0.1	1.2	1.2	4.1	5.6	3.9	26.8	1.8	30.8	2.3
	Btg/Eg	20-24	0.29	4.4	24	0.7	1.5	0.1	0.4	5.6	0.0	9.0	11.7	8.3	23.1	3.4	67.5	0.5
	Btg1	24-35	0.23	4.3	29	0.5	1.5	0.1	0.5	6.2	0.4	9.6	12.2	9.2	21.3	4.1	67.4	0.3
	Btg2	35-42	0.15	4.5	34	0.4	2.0	0.1	0.8	6.6	0.0	10.2	13.5	9.9	24.4	5.9	66.7	0.2
	BCg	42-67	0.16	4.6	50	0.3	2.3	0.1	0.9	6.0	0.6	10.8	14.4	10.2	24.2	6.3	58.8	0.1
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Kenefick fine sandy loam:[1]																		
(S89LA-037-20)	Ap	0-4	1.46	6.2	169	4.3	0.6	0.4	0.0	---	---	6.0	11.3	---	46.9	0.0	---	7.2
	A/B	4-8	0.85	6.6	80	4.0	0.6	0.3	0.0	---	---	5.9	10.8	---	45.4	0.0	---	6.7
	Bt1	8-22	0.22	6.3	100	3.6	2.9	0.2	0.1	---	---	6.6	13.4	---	50.7	0.7	---	1.2
	Bt2	22-42	0.05	5.1	81	0.9	3.4	0.2	0.1	0.0	0.2	9.0	13.6	4.8	33.8	0.7	0.0	0.3
	BC	42-58	0.02	4.9	59	0.2	2.1	0.1	0.0	1.2	0.4	4.2	6.6	4.0	36.4	0.0	30.0	0.1
	C	58-70	0.01	5.0	51	0.3	0.8	0.1	0.0	0.8	0.2	1.8	3.0	2.2	40.0	0.0	36.4	0.4
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Loring silt loam:[1]																		
(S89LA-037-35)	Ap	0-6	1.55	4.3	151	2.6	0.5	0.1	0.0	0.8	1.0	7.8	11.0	5.0	29.1	0.0	16.0	5.2
	BE	6-10	0.77	5.4	100	4.6	0.4	0.1	0.1	2.0	0.0	9.0	14.2	7.2	36.6	0.7	27.8	11.5
	Bt	10-23	0.53	6.2	88	6.3	1.7	0.2	0.1	1.4	2.2	6.0	14.3	11.9	58.0	0.7	11.8	3.7
	Btx1	23-28	0.25	5.0	23	2.8	3.2	0.2	0.0	2.6	0.0	6.0	12.2	8.8	50.8	0.0	29.5	0.9
	Btx2	28-39	0.30	5.0	22	2.0	3.1	0.2	0.1	2.6	1.0	6.6	12.0	9.0	45.0	0.8	28.9	0.6
	Btx3	39-51	0.22	5.1	17	1.1	2.4	0.1	0.1	3.0	1.2	7.8	11.5	7.9	32.2	0.9	38.0	0.5
	C	51-60	0.07	5.2	18	1.2	2.7	0.1	0.2	2.6	1.2	7.7	11.9	8.0	35.3	1.7	32.5	0.4
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Loring silt loam:[9]																		
(S89LA-037-86)	Ap	0-6	1.98	4.4	79	1.8	0.9	0.2	0.1	1.0	0.4	6.0	9.0	4.4	33.3	1.1	22.7	2.0
	BE	6-11	0.70	4.6	55	1.3	0.9	0.2	0.1	3.4	0.2	5.9	8.4	6.1	29.8	1.2	55.7	1.4
	Bt	11-25	0.35	5.0	51	1.5	1.9	0.2	0.1	4.2	0.2	8.4	12.1	8.1	30.6	0.8	51.9	0.8
	Btx1	25-35	0.10	5.3	57	1.4	2.7	0.2	0.2	3.6	0.4	8.3	12.8	8.5	35.2	1.6	42.4	0.5
	Btx2	35-44	0.12	5.0	46	1.5	2.8	0.2	0.2	3.6	0.2	8.3	13.0	8.5	36.2	1.5	42.4	0.5
	Btx3	44-60	0.12	5.1	69	1.8	3.0	0.2	0.3	2.2	0.4	7.2	12.5	7.9	42.4	2.4	27.8	0.6
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See footnotes at end of table.

Table 16.--Fertility Test D[illegible] Selected Soils--Continued

Soil name and sample number	Horizon	Depth	Organic matter content	pH 1:1 H_2O	Extractable phosphorus	Exchangeable cations: Ca	Mg	K	Na	Al	H	Total acidity	Cation-exchange capacity (sum)	Cation-exchange capacity (effective)	Base saturation (sum)	Saturation: Sum of cation-exchange capacity, Na	Saturation: Effective cation-exchange capacity, Al	Ca/Mg
		In	Pct		Ppm	----------Milliequivalents/100 grams of soil----------									Pct	Pct	Pct	
Lytle silt loam:[10]	A	0-6	2.30	3.9	106	0.4	0.2	0.1	0.0	2.2	0.4	9.6	10.3	3.3	6.8	0.0	66.7	2.0
(S89LA-037-10)	Bt1	6-16	0.49	4.9	63	2.0	2.1	0.2	0.1	3.8	0.2	12.0	16.4	8.4	26.8	0.6	45.2	1.0
	Bt2	16-24	0.03	5.0	57	0.7	2.8	0.2	0.1	4.4	0.4	12.6	16.4	8.6	23.2	0.6	51.2	0.3
	2B/E1	24-30	0.16	4.9	65	0.3	3.0	0.2	0.1	3.0	0.6	10.8	14.4	7.2	25.0	0.7	41.7	0.1
	2B/E2	30-36	0.13	4.9	54	0.3	2.5	0.2	0.1	0.8	0.2	10.2	13.3	4.1	23.3	0.8	19.5	0.1
	2B't1	36-42	0.01	4.9	50	0.2	2.2	0.2	0.1	2.0	0.4	9.0	11.7	5.1	23.1	0.9	39.2	0.1
	2B't2	42-60	0.19	4.8	34	0.3	2.1	0.2	0.1	2.0	0.6	7.2	9.9	5.3	27.3	1.0	37.7	0.1
	---	---	---	---	---	---	---	---	---	---	---	---	---	---	65.7	---	---	---
Lytle silt loam:[11]	Ap	0-8	1.35	6.9	231	7.9	1.1	0.5	0.0	0.0	0.4	5.0	15.5	9.9	61.3	0.0	0.0	7.2
(S89LA-037-16)	Bt1	8-12	0.66	7.3	83	5.0	0.8	0.1	0.0	0.0	0.4	5.4	11.3	6.3	52.2	0.0	0.0	6.3
	Bt2	12-24	0.31	7.5	95	6.7	0.9	0.1	0.1	0.0	0.4	5.3	13.1	8.2	59.5	0.8	0.0	7.4
	2B/E	24-33	0.16	7.7	126	10.5	1.1	0.3	0.1	0.0	0.2	3.2	17.2	12.2	69.8	0.6	0.0	9.5
	2B't1	33-42	0.13	7.4	116	6.9	1.4	0.2	0.0	0.0	0.0	5.3	13.8	8.5	61.6	0.0	0.0	4.9
	2B't2	42-60	0.14	7.2	100	4.8	1.9	0.1	0.0	0.0	0.0	4.2	11.0	6.8	61.8	0.0	0.0	2.5
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Morganfield silt loam:[1]	A	0-4	2.35	6.3	71	3.1	1.2	0.1	0.0	0.0	0.4	4.4	8.8	4.8	50.0	0.0	0.0	2.6
(S91LA-037-18)	C1	4-26	0.87	5.8	52	8.0	2.7	0.2	0.1	0.0	0.4	4.4	15.4	11.4	71.4	0.6	0.0	3.0
	C2	26-50	0.37	5.8	53	4.0	1.8	0.1	0.1	0.0	0.2	3.7	9.7	6.2	61.9	1.0	0.0	2.2
	C3	50-60	0.19	5.9	55	3.2	1.2	0.1	0.0	0.0	0.4	3.7	8.2	4.9	54.7	0.0	0.0	2.7
Natchez silt loam:[1]	A	0-2	2.42	5.7	62	7.3	3.3	0.3	0.1	0.0	1.0	11.1	22.1	12.0	49.8	0.5	0.0	2.2
(S91LA-125-22)	E	2-5	0.63	4.7	114	3.8	3.9	0.3	0.1	0.0	0.8	12.6	20.7	8.9	39.1	0.5	0.0	1.0
	Bw1	5-11	0.24	4.9	156	4.8	4.2	0.3	0.1	0.0	0.8	11.8	21.2	10.2	44.3	0.5	0.0	1.1
	Bw2	11-41	0.19	5.1	196	5.6	4.2	0.3	0.1	0.0	1.0	8.1	18.3	11.2	55.7	0.5	0.0	1.3
	C	41-60	0.16	7.8	200	20.9	3.3	0.2	0.1	0.0	1.0	4.4	28.9	25.5	84.8	0.3	0.0	6.3
Ochlockonee fine sandy loam:[1]	A	0-6	0.78	4.2	60	1.2	0.4	0.1	0.0	1.0	0.8	4.2	5.9	3.5	28.8	0.0	28.6	3.0
(S89LA-037-34)	C1	6-26	0.87	4.0	67	0.5	0.2	0.1	0.0	3.0	0.2	6.0	6.8	4.0	11.8	0.0	75.0	2.5
	C2	26-42	0.31	4.6	19	0.5	0.3	0.1	0.0	3.0	0.6	4.8	5.7	4.5	15.8	0.0	66.7	1.7
	C3	42-60	0.26	4.4	75	0.5	0.3	0.1	0.0	2.8	0.4	5.9	6.8	4.1	13.2	0.0	68.3	1.7
Olivier silt loam:[1]	Ap	0-7	1.69	4.7	96	3.0	1.2	0.2	0.2	0.8	0.4	6.0	10.6	5.8	43.4	1.9	13.8	2.5
(S89LA-037-39)	E	7-12	0.67	5.2	66	3.0	1.3	0.1	0.2	1.0	0.8	6.6	11.2	6.4	41.1	1.8	15.6	2.3
	Bt1	12-19	0.62	5.2	77	2.5	2.4	0.2	0.3	1.2	0.2	8.4	13.8	6.8	39.1	2.2	17.6	1.0
	Bt2	19-26	0.30	5.4	17	1.6	2.7	0.2	0.3	4.2	0.0	9.0	13.8	9.0	34.8	2.2	46.7	0.6
	Btx1	26-32	0.11	5.1	94	1.3	3.1	0.2	0.3	3.4	1.0	10.8	15.7	9.3	31.2	1.9	36.6	0.4
	Btx2	32-60	0.15	5.1	14	1.3	3.4	0.2	0.3	3.8	0.6	8.9	14.1	9.6	36.9	2.1	39.6	0.4
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See footnotes at end of table.

Table 16.--Fertility Test Data for Selected Soils--Continued

Soil name and sample number	Horizon	Depth	Organic matter content	pH 1:1 H_2O	Extractable phosphorus	Exchangeable cations Ca	Mg	K	Na	Al	H	Total acidity	Cation-exchange capacity (sum)	Cation-exchange capacity (effective)	Base saturation (sum)	Saturation: Sum of cation-exchange capacity Na	Saturation: Effective cation-exchange capacity Al	Ca/Mg
		In	Pct		Ppm	--Milliequivalents/100 grams of soil--									Pct	Pct	Pct	
Olivier silt loam:[12] (S89LA-037-78)	A	0-5	1.56	5.1	75	1.7	0.8	0.2	0.1	0.2	0.4	3.6	6.4	3.4	43.8	1.6	5.9	2.1
	E	5-10	0.68	5.2	47	1.4	0.9	0.1	0.1	0.8	0.2	3.5	6.0	3.5	41.7	1.7	22.9	1.6
	Bt1	10-18	0.47	5.2	65	2.7	2.9	0.2	0.1	1.8	0.2	2.9	8.8	7.9	67.0	1.1	22.8	0.9
	Bt2	18-24	0.29	5.3	63	3.2	3.6	0.3	0.1	2.0	0.4	3.0	10.2	9.6	70.6	1.0	20.8	0.9
	Btx1	24-31	0.30	5.3	88	3.1	3.7	0.4	0.1	2.2	0.2	4.8	12.1	9.7	60.3	0.8	22.7	0.8
	Btx2	31-60	0.23	5.3	84	2.6	3.3	0.3	0.1	0.8	0.2	3.6	9.9	7.3	63.6	1.0	11.0	0.8
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Ouachita silt loam:[1] (S89LA-037-31)	A	0-7	3.65	4.0	94	1.0	0.7	0.3	0.0	2.0	0.4	12.6	14.6	4.4	13.7	0.0	45.5	1.4
	Bw1	7-15	1.04	4.2	71	0.2	0.2	0.1	0.0	3.4	0.6	9.0	9.5	4.5	5.3	0.0	75.6	1.0
	Bw2	15-24	0.68	4.7	31	0.1	0.2	0.1	0.0	4.0	1.0	9.6	10.0	5.4	4.0	0.0	74.1	0.5
	Bw3	24-40	0.58	4.7	37	0.1	0.3	0.1	0.0	4.0	0.5	9.4	9.9	5.1	5.1	0.0	78.4	0.3
	BC	40-48	0.46	4.6	89	0.2	0.6	0.1	0.1	4.6	0.4	10.8	11.8	6.0	8.5	0.8	76.7	0.3
	2C	48-60	0.41	4.6	81	0.2	0.6	0.1	0.1	3.6	1.4	10.2	11.2	6.0	8.9	0.9	60.0	0.3
Robinsonville fine sandy loam:[1] (S91LA-125-3)	Ap	0-7	0.65	7.7	161	4.8	1.9	0.2	0.0	0.0	0.6	5.2	12.1	7.5	57.0	0.0	0.0	2.5
	C1	7-17	0.57	7.9	157	5.5	1.9	0.2	0.0	0.0	0.4	5.2	12.8	8.0	59.4	0.0	0.0	2.9
	C2	17-24	0.56	7.9	161	5.2	1.5	0.1	0.0	0.0	0.6	5.9	12.7	7.4	53.5	0.0	0.0	3.5
	C3	24-40	0.24	8.1	166	6.0	1.7	0.2	0.0	0.0	0.6	6.7	14.6	8.5	54.1	0.0	0.0	3.5
	C4	40-45	0.29	8.1	203	6.2	1.8	0.2	0.0	0.0	0.4	5.9	14.1	8.6	58.2	0.0	0.0	3.4
	C5	45-50	0.01	8.1	141	3.9	1.2	0.1	0.0	0.0	0.6	5.9	11.1	5.8	46.8	0.0	0.0	3.3
	C6	50-60	0.19	8.2	159	6.2	1.9	0.2	0.0	0.0	0.2	5.9	14.2	8.5	58.5	0.0	0.0	3.3
Ruston sandy loam:[1] (S89LA-037-28)	A	0-2	6.08	4.0	192	6.1	2.2	0.6	0.1	1.0	0.2	9.8	18.8	10.2	47.9	0.5	9.8	2.8
	E	2-4	1.45	4.1	46	1.1	0.6	0.2	0.0	1.4	0.0	1.8	3.7	3.3	51.4	0.0	42.4	1.8
	Bt1	4-24	0.29	4.6	46	0.8	0.9	0.2	0.0	3.8	0.4	6.6	8.5	6.1	22.4	0.0	62.3	0.9
	Bt2	24-35	0.03	4.5	44	0.2	1.2	0.1	0.2	3.4	0.8	5.4	7.1	5.9	23.9	2.8	57.6	0.2
	Bt/E	35-45	0.04	4.6	20	0.2	1.1	0.1	0.1	3.0	0.2	8.4	9.9	4.7	15.2	1.0	63.8	0.2
	B't	45-60	0.12	4.6	39	0.4	1.3	0.1	0.1	2.2	0.8	4.8	6.7	4.9	28.4	1.5	44.9	0.3
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Sharkey clay:[13] (S91LA-125-5)	Ap	0-6	3.81	5.9	266	16.4	5.7	0.8	0.1	0.0	0.6	14.8	37.8	23.6	60.8	0.3	0.0	2.9
	A,Bg1	6-19	1.87	6.7	211	25.7	8.6	0.9	0.3	0.0	0.4	8.1	43.6	35.9	81.4	0.7	0.0	3.0
	Bg2	19-27	1.09	6.9	162	30.1	10.3	0.8	0.5	0.0	0.4	13.3	55.0	42.1	75.8	0.9	0.0	2.9
	Bssg1	27-42	0.86	7.4	207	30.8	11.2	0.9	0.6	0.0	0.6	11.1	54.6	43.9	79.7	1.1	0.0	2.8
	Bssg2	42-60	0.72	7.8	301	36.8	11.3	1.0	0.6	0.0	0.6	10.4	60.1	50.3	82.7	1.0	0.0	3.3

See footnotes at end of table.

Table 16.--Fertility Test Data for Selected Soils--Continued

Soil name and sample number	Horizon	Depth	Organic matter content	pH 1:1 H_2O	Extractable phosphorus	Exchangeable cations: Ca	Mg	K	Na	Al	H	Total acidity	Cation-exchange capacity (sum)	Cation-exchange capacity (effective)	Base saturation (sum)	Saturation: Sum of cation-exchange capacity Na	Saturation: Effective cation-exchange capacity Al	Ca/Mg
		In	Pct		Ppm	----------Milliequivalents/100 grams of soil----------									Pct	Pct	Pct	
Smithdale sandy loam:[1]																		
(S89LA-037-21)	A	0-2	1.99	4.6	64	1.1	0.6	0.2	0.0	1.0	0.4	6.0	7.9	3.3	24.1	0.0	30.3	1.8
	E	2-8	0.93	4.9	29	0.7	0.4	0.1	0.0	1.2	0.2	5.9	7.1	2.6	16.9	0.0	46.2	1.8
	Bt1	8-15	0.62	4.9	62	1.3	1.6	0.1	0.0	1.2	0.6	5.9	8.9	4.8	33.7	0.0	25.0	0.8
	Bt2	15-22	0.13	5.0	41	0.2	0.9	0.1	0.0	3.0	0.4	4.8	6.0	4.6	20.0	0.0	65.2	0.2
	Bt3	22-44	0.01	5.0	41	0.2	0.9	0.1	0.0	2.0	0.8	4.2	5.4	4.0	22.2	0.0	50.0	0.2
	Bt4	44-68	0.03	4.9	21	0.2	0.7	0.1	0.0	2.2	0.8	3.0	4.0	4.0	25.0	0.0	55.0	0.3
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Tangi silt loam:[14]																		
(S89LA-037-74)	Ap	0-4	2.29	4.5	35	0.8	0.3	0.1	0.1	1.4	0.6	4.2	5.5	3.3	23.6	1.8	42.4	2.7
	Bt1	4-11	0.73	5.0	31	1.1	0.7	0.1	0.0	1.6	0.4	1.8	3.7	3.9	51.4	0.0	41.0	1.6
	Bt2	11-19	0.65	5.2	58	3.5	1.8	0.2	0.1	1.8	0.2	4.8	10.4	7.6	53.8	1.0	23.7	1.9
	2Btx	19-37	0.05	5.1	28	0.2	1.0	0.1	0.0	3.6	0.2	4.7	6.0	5.1	21.7	0.0	70.6	0.2
	2B't	37-60	0.20	5.0	33	0.6	1.2	0.1	0.0	3.0	0.4	4.2	6.1	5.3	31.1	0.0	56.6	0.5
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Tangi silt loam:[15]																		
(S89LA-037-3)	Ap	0-4	2.01	4.5	194	1.7	1.3	1.0	0.0	0.0	0.4	9.6	13.6	4.4	29.4	0.0	0.0	1.3
	Bt1	4-10	0.94	5.0	135	2.5	1.6	1.3	0.0	0.4	0.6	9.5	14.9	6.4	36.2	0.0	6.3	1.6
	Bt2	10-19	0.40	4.9	229	3.1	2.1	1.3	0.1	1.8	0.4	12.0	18.6	8.8	35.5	0.5	20.5	1.5
	2Btx1	19-34	0.19	4.5	85	0.6	0.6	0.4	0.0	2.4	0.4	8.4	10.0	4.4	16.0	0.0	54.5	1.0
	2Btx2	34-52	0.15	4.2	59	0.8	1.0	0.2	0.0	3.8	0.2	9.6	11.6	6.0	17.2	0.0	63.3	0.8
	2Btx3	52-60	0.01	4.1	54	1.0	0.9	0.1	0.2	5.4	0.0	9.5	11.7	7.6	18.8	1.7	71.1	1.1
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Toula silt loam:[16]																		
(S89LA-037-82)	A	0-4	2.09	4.6	57	0.6	0.3	0.1	0.0	1.8	0.2	5.4	6.4	3.0	15.6	0.0	60.0	2.0
	BE	4-11	0.63	4.7	40	0.5	1.0	0.1	0.1	2.4	0.4	4.8	6.5	4.5	26.2	1.5	53.3	0.5
	Bt1	11-24	0.31	5.2	44	0.4	1.3	0.1	0.2	2.2	0.4	4.7	6.7	4.6	29.9	3.0	47.8	0.3
	Bt2	24-32	0.11	5.2	65	0.6	3.8	0.2	1.0	5.0	1.0	4.8	10.4	11.6	53.8	9.6	43.1	0.2
	Btx1	32-42	0.03	5.2	69	0.9	5.0	0.2	1.3	2.6	1.4	4.7	12.1	11.4	61.2	10.7	22.8	0.2
	Btx2	42-60	0.05	5.1	73	1.6	5.2	0.1	1.7	1.0	1.6	4.8	13.4	11.2	64.2	12.7	8.9	0.3
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Tunica clay:[1]																		
(S91LA-037-82)	Ap	0-11	3.04	5.3	222	19.6	7.1	0.7	0.2	0.0	0.8	16.3	43.9	28.4	62.9	0.5	0.0	2.8
	Bg1	11-23	1.52	6.0	221	22.7	9.0	0.8	0.3	0.0	0.6	10.4	43.2	33.4	75.9	0.7	0.0	2.5
	Bg2	23-33	1.34	6.2	227	23.2	10.2	0.7	0.3	0.0	0.4	11.8	46.2	34.8	74.5	0.6	0.0	2.3
	2Cg	33-60	0.25	7.0	131	11.3	4.7	0.3	0.3	0.0	0.2	4.4	21.0	16.8	79.0	1.4	0.0	2.4

See footnotes at end of table.

Table 16.--Fertility Test [illegible] .or Selected Soils--Continued

[1] This is the typical pedon for the series in East and West Feliciana Parishes. For a description of the soil, see the section "Detailed Soil Map Units."

[2] This is the base saturation of the soil at the depth critical for classifying the soil at the order level.

[3] This Calhoun pedon is about 6.75 miles southwest of McManus; 850 feet south and 1,225 feet east of the northwest corner of Spanish Land Grant sec. 87, T. 4 S., R. 1 W.

[4] This Deerford pedon is about 5.5 miles northeast of Zachary; 1,350 feet south and 275 feet west of the northeast corner of sec. 11, T. 4 S., R. 1 E. This pedon classifies as a Glossaqualfs rather than a Natraqualfs.

[5] This Dexter pedon is on the Idlewild Experiment Station, 4,000 feet northeast of headquarters, 55 feet east of turn row; Spanish Land Grant sec. 44, T. 3 S., R. 2 E.

[6] This Feliciana pedon is about 375 feet north of Highway 964, 75 feet east of field road; Spanish Land Grant sec. 59, T. 3 S., R. 2 W.

[7] This Feliciana pedon is about 580 feet south of Highway 964, 450 feet northeast of the curve in Highway 61; Spanish Land Grant sec. 59, T. 3 S., R. 2 W.

[8] This Guyton pedon is about 2.1 miles northwest of Grangeville, 6,000 feet west of Amite River, 120 feet south of dirt road; Spanish Land Grant sec. 56, T. 3 S., R. 3 E.

[9] This Loring pedon is about 4 miles southwest of Ethel, 0.5 mile northwest of Highway 955, 120 feet northwest of a gravel road, 150 feet west of drainageway channel; Spanish Land Grant sec. 101, T. 3 S., R. 1 W.

[10] This Lytle pedon is about 2 miles southwest of Felixville, 5 miles north on a gravel road from a pipeline corridor, 210 feet west of a gravel road; Spanish Land Grant sec. 60, T. 2 S., R. 3 E.

[11] This Lytle pedon is on the Idlewild Experiment Station, 1,650 feet south of intersection of parish roads, 100 feet east of the north-south road; Spanish Land Grant sec. 46, T. 3 S., R. 2 E. This pedon is an Alfisols rather than an Ultisols.

[12] This Olivier pedon is about 7.5 miles northwest of Slaughter, 0.6 mile northeast on parish road from its intersection with Highway 61; Spanish Land Grant sec. 75, T. 4 S., R. 2 W.

[13] This is the typical pedon for the Sharkey series. For a description of the soil, see the sections "Detailed Soil Map Units" and "Soil Series and Their Morphology."

[14] This Tangi pedon is about 1,575 feet east-northeast and 100 feet north of the southwest corner of Spanish Land Grant sec. 46, T. 3 S., R. 2 E.; USGS Bluff Creek, Louisiana, topographic quadrangle, latitude 30 degrees 48 minutes 36 seconds N., longitude 90 degrees 57 minutes 34 seconds W., NAD 84.

[15] This Tangi pedon has the same location as the Tangi typifying pedon for the Tangi Series. For a description of the soil, see the sections "Detailed Soil Map Units" and "Soil Series and Their Morphology."

[16] This Toula pedon is about 800 feet east of the channel of Steep Bayou, 1,200 feet north of parish line, 100 feet north of parish road; Spanish Land Grant sec. 61, T. 4 S., R. 3 E. This pedon is an Alfisols rather than an Ultisols.

ANALYTICAL AND ENVIRONMENTAL TESTING, INC.

Corporate: 1717 Seaboard Drive • Baton Rouge, LA 70810 • 800-364-1930
Louisiana Division: Baton Rouge, LA • (225) 769-1930
Alabama Division: Mobile, AL • (251) 344-9915
Texas Division: Bryan, TX • (979) 778-2828

03/22/2005

ANALYTICAL & ENVIRONMENTAL TESTING, INC.
ANALYTICAL DATA PACKAGE
Project Number: 90057

Prepared for:
Mike Clement
Remediation Services
1225 Neosho
Baton Rouge, LA 70804

ANALYTICAL AND ENVIRONMENTAL TESTING, INC.

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03/22/2005

Mike Clement
Remediation Services
1225 Neosho
Baton Rouge, LA 70804

AET Project No.: 90057

Dear Mike,

Enclosed is the final data report for analysis of sample(s) submitted 03/10/2005.

All analysis were within RCRA regulatory limits.
All analysis were accomplished within EPA specified holding times.
All method blanks were found to be within quality control criteria.
All Lab Control Sample analyses met quality control criteria.
All ICV, ICB, CCV and CCB analyses met quality control criteria.

The following abbreviations may be contained in this report:

DilOut = Diluted Out
NA = Not Applicable
TNTC = Too Numerous to Count
BA # = Batch Number
ND = Not Detected above MQL

As mandated by ISO Guide 25, this report shall not be reproduced except in full without the permission of Analytical & Environmental Testing, Inc. Documented results relating to the sample(s) specified are included along with the original Chain of Custody.

Analytical & Environmental Testing, Inc. appreciates the opportunity to perform analyses of this type for you. If you have any questions concerning this project or any of our other services, please call.

www.aetesting.com

Certificate of Results
LELAP Certification: 01978

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03/22/2005

Mike Clement
Remediation Services
1225 Neosho
Baton Rouge, LA 70804

Samples received: 03/10/2005

Samples collected by Remediation Services
Samples transported by A & E Testing
AET Project No.: 90057
Louisiana Division

Parameter	Analytical Result		Date Tested	Time Tested	Analyst	Method Number
**Client ID: PH1 03/10/2005 9:00am Lab ID: 90057/01			Matrix: Other			
Corrosivity	3.84	su	03/15/2005	2:00pm	EJF	9045C
Ignitability	neg	mm/sec	03/18/2005	11:30am	DMP	1030
Reactivity Cyanide	<50	mg/Kg	03/17/2005	4:00pm	DMP	SW846
Reactivity Sulfide	<50	mg/Kg	03/24/2005	8:00am	EFJ	SW846
TCLP	BA #198		03/14/2005	3:00pm	EJF	1311
Metals Digestion	BA #928		03/15/2005	4:30pm	DMP	3010A
Arsenic	<0.040	mg/L	03/15/2005	9:17pm	DMP	6010A
Barium	0.194	mg/L	03/15/2005	9:17pm	DMP	6010A
Cadmium	0.014	mg/L	03/15/2005	9:17pm	DMP	6010A
Chromium	<0.002	mg/L	03/15/2005	9:17pm	DMP	6010A
Lead	<0.004	mg/L	03/15/2005	9:17pm	DMP	6010A
Mercury	<0.0002	mg/L	03/12/2005	10:12am	DMP	7470A
Selenium	0.075	mg/L	03/15/2005	9:17pm	DMP	6010A
Silver	<0.001	mg/L	03/15/2005	9:17pm	DMP	6010A
Volatile Compounds	BA #587		03/16/2005	2:59pm	MPB	8260B
Benzene	<0.10	mg/L	03/16/2005	2:59pm	MPB	8260B
Carbon tetrachloride	<0.10	mg/L	03/16/2005	2:59pm	MPB	8260B
Chlorobenzene	<0.10	mg/L	03/16/2005	2:59pm	MPB	8260B
Chloroform	<0.10	mg/L	03/16/2005	2:59pm	MPB	8260B
1,4-Dichlorobenzene	<0.10	mg/L	03/16/2005	2:59pm	MPB	8260B
1,2-Dichloroethane	<0.10	mg/L	03/16/2005	2:59pm	MPB	8260B
1,1-Dichloroethene	<0.10	mg/L	03/16/2005	2:59pm	MPB	8260B
Methyl ethyl ketone	<0.10	mg/L	03/16/2005	2:59pm	MPB	8260B
Tetrachloroethene	<0.10	mg/L	03/16/2005	2:59pm	MPB	8260B
Trichloroethene	<0.10	mg/L	03/16/2005	2:59pm	MPB	8260B
Vinyl chloride	<0.10	mg/L	03/16/2005	2:59pm	MPB	8260B
Surrogates			03/16/2005	2:59pm	MPB	8260B
4-Bromofluorobenzene	96.0	%	03/16/2005	2:59pm	MPB	8260B
Dibromofluoromethane	83.7	%	03/16/2005	2:59pm	MPB	8260B
1,2-Dichloroethane-d4	89.0	%	03/16/2005	2:59pm	MPB	8260B
Toluene-d8	104	%	03/16/2005	2:59pm	MPB	8260B

03/22/2005
Remediation Services

Parameter	Analytical Result		Date Tested	Time Tested	Analyst	Method Number
**Client ID: PH1 03/10/2005 9:00am Lab ID: 90057/01			Matrix: Other			
TCLP	BA #198		03/14/2005	3:00pm	EJF	1311
Semi-Volatile Compounds			03/18/2005	4:27pm	MPB	8270C
Semi-Volatile Extraction	BA #436		03/15/2005	2:10pm	TMP	3520
Cresols, meta+para	0.2	mg/L	03/18/2005	4:27pm	MPB	8270C
Cresols, ortho	<0.100	mg/L	03/18/2005	4:27pm	MPB	8270C
2,4-Dinitrotoluene	<0.100	mg/L	03/18/2005	4:27pm	MPB	8270C
Hexachlorobenzene	<0.100	mg/L	03/18/2005	4:27pm	MPB	8270C
Hexachlorobutadiene	<0.100	mg/L	03/18/2005	4:27pm	MPB	8270C
Hexachloroethane	<0.100	mg/L	03/18/2005	4:27pm	MPB	8270C
Nitrobenzene	<0.100	mg/L	03/18/2005	4:27pm	MPB	8270C
Pentachlorophenol	<1.000	mg/L	03/18/2005	4:27pm	MPB	8270C
Pyridine	<0.100	mg/L	03/18/2005	4:27pm	MPB	8270C
2,4,6-Trichlorophenol	<0.100	mg/L	03/18/2005	4:27pm	MPB	8270C
2,4,5-Trichlorophenol	<0.100	mg/L	03/18/2005	4:27pm	MPB	8270C
Surrogates			03/18/2005	4:27pm	MPB	8270C
2-Fluorobiphenyl	67.0	%	03/18/2005	4:27pm	MPB	8270C
2-Fluorophenol	92.0	%	03/18/2005	4:27pm	MPB	8270C
Nitrobenzene-d5	62.0	%	03/18/2005	4:27pm	MPB	8270C
Phenol-d6	88.0	%	03/18/2005	4:27pm	MPB	8270C
Terphenyl-d14	43.0	%	03/18/2005	4:27pm	MPB	8270C
2,4,6-Tribromophenol	62.0	%	03/18/2005	4:27pm	MPB	8270C
Pesticide Compounds			03/17/2005	7:20pm	TMP	8081
Pesticide Extraction	BA #316		03/15/2005	2:10pm	TMP	3520
Chlordane	<0.030	mg/L	03/17/2005	7:20pm	TMP	8081
Endrin	<0.010	mg/L	03/17/2005	7:20pm	TMP	8081
Heptachlor	<0.005	mg/L	03/17/2005	7:20pm	TMP	8081
Heptachlor Epoxide	<0.005	mg/L	03/17/2005	7:20pm	TMP	8081
Lindane	<0.010	mg/L	03/17/2005	7:20pm	TMP	8081
Methoxychlor	<1.000	mg/L	03/17/2005	7:20pm	TMP	8081
Toxaphene	<0.100	mg/L	03/17/2005	7:20pm	TMP	8081
Surrogate			03/17/2005	7:20pm	TMP	
Tetrachloroxylene	69.8	%	03/17/2005	7:20pm	TMP	8081
Herbicide Compounds			03/17/2005	10:56am	TMP	8151A
Herbicide Extraction	BA #182		03/15/2005	2:10pm	TMP	8150
2,4-D	<1.00	mg/L	03/17/2005	10:56am	TMP	8151A
2,4,5-TP(Silvex)	<0.10	mg/L	03/17/2005	10:56am	TMP	8151A
Surrogate			03/17/2005	10:56am	TMP	
DCPAA	45.8	mg/L	03/17/2005	10:56am	TMP	8151A

All of the above tests were performed as outlined in the U.S. E.P.A. "Methods for Chemical Analysis of Water and Wastes," "Standard Methods for the Examination of Water and Wastewater," and U.S. E.P.A. "Test Methods for the Evaluation of Solid Waste -- SW846." Other methods as approved by the client are utilized.
Detection limits are affected by dilution factors. (***Data provided by Client)
Please note: Unless otherwise directed, the samples listed above will be retained no longer than 60 days and will be disposed of by laboratory staff.

Certification:

W. Nathan Levy, III
President

Analytical and Environmental Testing, Inc.

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03/22/2005

Quality Control Report
AET Project No.: 90057

Parameter	Analytical Result		True Value	Lower Limit	Upper Limit	Test Date	Batch Number
Corrosivity	7.00	su	7.00	0.70	13.3	03/15/2005	290
Ignitability	38 sec	mm/sec	41	41.0	41.0	03/18/2005	107
Reactivity Cyanide	50.0	mg/Kg	50	50.0	50.0	03/17/2005	228
Reactivity Sulfide	50.0	mg/Kg	50	50.0	50.0	03/17/2005	229
Arsenic	0.934	mg/L	1.00	0.818	1.182	03/15/2005	928
Barium	0.959	mg/L	1.00	0.854	1.146	03/15/2005	928
Cadmium	0.970	mg/L	1.00	0.875	1.125	03/15/2005	928
Chromium	0.992	mg/L	1.00	0.873	1.128	03/15/2005	928
Lead	0.983	mg/L	1.00	0.879	1.121	03/15/2005	928
Mercury	0.0056	mg/L	0.005	0.0043	0.0058	03/12/2005	641
Selenium	0.973	mg/L	1.00	0.89	1.11	03/15/2005	928
Silver	1.12	mg/L	1.00	0.785	1.215	03/15/2005	928
Volatile Compounds						03/16/2005	587
Benzene	59.3	µg/L	50.0	37.8	62.3	03/16/2005	587
Carbon tetrachloride	59.5	µg/L	50.0	32.8	67.3	03/16/2005	587
Chlorobenzene	61.9	µg/L	50.0	38.0	62.0	03/16/2005	587
Chloroform	62.7	µg/L	50.0	14.5	85.5	03/16/2005	587
1,4-Dichlorobenzene	64.2	µg/L	50.0	30.3	69.8	03/16/2005	587
1,2-Dichloroethane	62.3	µg/L	50.0	34.8	65.3	03/16/2005	587
1,1-Dichloroethene	60.5	µg/L	50.0	32.8	67.3	03/16/2005	587
Methyl ethyl ketone	52.1	µg/L	50.0	19.3	80.8	03/16/2005	587
Tetrachloroethene	75.7	µg/L	50.0	28.5	71.5	03/16/2005	587
Trichloroethene	62.5	µg/L	50.0	37.0	63.0	03/16/2005	587
Vinyl chloride	81.3	µg/L	50.0	16.5	83.5	03/16/2005	587
Surrogates						03/16/2005	587
4-Bromofluorobenzene	98.1	%	1.00	86.0	115	03/16/2005	587
Dibromofluoromethane	98.8	%	1.00	86.0	118	03/16/2005	587
1,2-Dichloroethane-d4	106	%	1.00	80.0	120	03/16/2005	587
Toluene-d8	100	%	1.00	88.0	110	03/16/2005	587

Quality Control Report
AET Project No.: 90057

Parameter	Analytical Result		True Value	Lower Limit	Upper Limit	Test Date	Batch Number
Semi-Volatile Compounds						03/18/2005	436
2,4-Dinitrotoluene	82.9	µg/L	1.00	41.8	158	03/18/2005	436
Hexachlorobenzene	68.4	µg/L	1.00	21.6	178	03/18/2005	436
Hexachlorobutadiene	53.9	µg/L	1.00	46.7	153	03/18/2005	436
Hexachloroethane	57.6	µg/L	1.00	57.4	143	03/18/2005	436
Nitrobenzene	67.3	µg/L	1.00	33.4	167	03/18/2005	436
Pentachlorophenol	87.0	µg/L	1.00	D	219	03/18/2005	436
Pyridine	77.7	µg/L	1.00	36.9	163	03/18/2005	436
2,4,5-Trichlorophenol	52.3	µg/L	1.00	28.7	171	03/18/2005	436
2,4,6-Trichlorophenol	86.3	µg/L	1.00	17.5	183	03/18/2005	436
Surrogates						03/18/2005	436
2-Fluorobiphenyl	62.2	%	1.00	43.0	116	03/18/2005	436
2-Fluorophenol	68.6	%	1.00	21.0	100	03/18/2005	436
Nitrobenzene-d5	77.5	%	1.00	35.0	114	03/18/2005	436
Phenol-d6	77.3	%	1.00	10	94.0	03/18/2005	436
Terphenyl-d14	62.7	%	1.00	33.0	141	03/18/2005	436
2,4,6-Tribromophenol	76.1	%	1.00	10	123	03/18/2005	436
Pesticide Compounds						03/17/2005	316
Endrin	0.872	µg/L	1.00	0.3	1.47	03/17/2005	316
Heptachlor	0.667	µg/L	1.00	0.34	1.11	03/17/2005	316
Lindane	0.674	µg/L	1.00	0.32	1.27	03/17/2005	316
Methoxychlor	0.969	µg/L	1.00	0.3	1.47	03/17/2005	316
Surrogate						03/17/2005	316
Tetrachloroxylene	66.1	%	1.00	30.0	130	03/17/2005	316
2,4-D	2.58	µg/L	5	2.5	7.5	03/18/2005	182
2,4,5-TP(Silvex)	2.63	µg/L	5	2.5	7.5	03/18/2005	182
Surrogate						03/18/2005	182
DCPAA	52.3	µg/L	1.00	20.0	120	03/18/2005	182

Quality Control samples are placed in routine sample sets daily so that you may better interpret your test results. * EPA publication

Page 1 of 1

ANALYTICAL ENVIRONMENTAL TESTING, INC.

[redacted]ET Project No.: 90057

Log In Person: K.D.B.

Log In Date/Time: 03/10 5:00p

Company: Remediation Service

Site Contact: Mike Clement

Report To: Mike Clement

Address: 1225 Neosho Dr.

City: Baton Rouge

State & Zip Code: LA 70802

Phone#: (225) 389-0804 Ext.

FAX#: (225) ~~389-0804~~ 389-0065 Ext.

SAMPLER

Authorized By:

Sampler:	[X] Client	[ ] AET
Transporter:	[ ] Client	[X] AET
Bottles:	[ ] Client	[X] AET

Matrix Codes	Turnaround	Surcharge
	__Hrs.	200%
[redacted]ater	[ ] 24 hrs.	150%
B=Sludge	[ ] 48 hrs.	100%
C=Soil	[X] 1 week	50%
D=Oil	[ ] 2 weeks	
E=Acid	[ ] 3 weeks	
F=Caustic		
G=100% Organic		
H=Solids&Misc.		

NOTE: Multiphase MUST BE split into separate subsamples

CHAIN OF CUSTODY

Relinquished by: [signature]
Date: 03/10/05 Time: 10:00a.m.
Received by: Kelvin Bradford
Date: 03/10/05 Time: 10:00a.m.

Relinquished by:
Date: Time:

Received by:
Date: Time:

Relinquished by:
Date: Time:

Received by:
Date: Time:

[redacted]nquished by:
Date: Time:

Received by:
Date: Time:

Analytical Request Form / Chain of Custody

23rd Edition 03/2004

Sample Site: or Client ID:	PH1	~~PH1~~		
Sample Date:	03/10/05	~~03/10/05~~		
SampleTime:	9:00a.m.	~~9:00a.m.~~		
Matrix Code:	H	~~H~~		
Storage Upon Arrival At Lab	Temp H C ICE (Y) N	~~Temp H C ICE (Y) N~~	Temp __ C ICE Y N	Temp __ C ICE Y N
AET Sample No.	1	~~2~~		

Division: BTR

Client Type:
[ ] DPW
[X] NPDES K.D.B
[X] RCRA
[ ] Drinking Water
[ ] Other

Approved By

All samples are preserved per EPA protocol

Comments

Parameter	Code	1	2	3	4
Alkalinity	(Alk)	[ ]	[ ]	[ ]	[ ]
Ammonia Nitrogen	(NH_3)	[ ]	[ ]	[ ]	[ ]
Ash	(Ash)	[ ]	[ ]	[ ]	[ ]
BOD-5 day	(BOD)	[ ]	[ ]	[ ]	[ ]
Bromide	*(Br)*	[ ]	[ ]	[ ]	[ ]
BTU	(BTU)	[ ]	[ ]	[ ]	[ ]
Chloride	(Cl)	[ ]	[ ]	[ ]	[ ]
Chlorine, Res.	(TRC)	[ ] ___	[ ] ___	[ ] ___	[ ] ___
COD	(COD)	[ ]	[ ]	[ ]	[ ]
Color	*(Color)*	[ ]	[ ]	[ ]	[ ]
Conductivity	(Cond)	[ ]	[ ]	[ ]	[ ]
Cyanide	(CN)	[ ]	[ ]	[ ]	[ ]
Cyanide-ATC	(CNATC)	[ ]	[ ]	[ ]	[ ]
Density	(DEN)	[ ]	[ ]	[ ]	[ ]
Dissolved Oxygen	(DO)	[ ] ___	[ ] ___	[ ] ___	[ ] ___
Flow (GPM)(field)	(Flow)	[ ] ___	[ ] ___	[ ] ___	[ ] ___
Fluoride	(F)	[ ]	[ ]	[ ]	[ ]
Halogens, Total	(TX)	[ ]	[ ]	[ ]	[ ]
Hardness	(Hard)	[ ]	[ ]	[ ]	[ ]
Moisture%	*(%M)*	[ ]	[ ]	[ ]	[ ]
Nitrite	(NO_2)	[ ]	[ ]	[ ]	[ ]
Nitrate	(NO_3)	[ ]	[ ]	[ ]	[ ]
Oil & Grease	(O&G)	[ ]	[ ]	[ ]	[ ]
pH (field)	(pH)	[ ] ___ su	[ ] ___ su	[ ] ___ su	[ ] ___ su
Phenol	(Phenol)	[ ]	[ ]	[ ]	[ ]
Phosphate, Ortho	(O Phos)	[ ]	[ ]	[ ]	[ ]
Phosphorus, Total	(T Phos)	[ ]	[ ]	[ ]	[ ]
Solids, Total	(TS)	[ ]	[ ]	[ ]	[ ]
Sulfate	(SO_4)	[ ]	[ ]	[ ]	[ ]
Sulfide	(S_2)	[ ]	[ ]	[ ]	[ ]
Sulfur, Total	(T Sulfur)	[ ]	[ ]	[ ]	[ ]
Surfactants	(Surf)	[ ]	[ ]	[ ]	[ ]
TDS	(TDS)	[ ]	[ ]	[ ]	[ ]
Temperature (field)	(Temp)	[ ] ___ C	[ ] ___ C	[ ] ___ C	[ ] ___ C
Thiocyanate	*(SCN)*	[ ]	[ ]	[ ]	[ ]
TKN	(TKN)	[ ]	[ ]	[ ]	[ ]
TOC	(TOC)	[ ]	[ ]	[ ]	[ ]
TON	(TON)	[ ]	[ ]	[ ]	[ ]
TOX	(TOX)	[ ]	[ ]	[ ]	[ ]
TPHC	*(TPHC)*	[ ]	[ ]	[ ]	[ ]
TSS	(TSS)	[ ]	[ ]	[ ]	[ ]
Turbidity	(Turb)	[ ]	[ ]	[ ]	[ ]
VSS	(VSS)	[ ]	[ ]	[ ]	[ ]

Date:
Time:
Analyst:

Date:
Time:
Analyst:

Date:
Time:
Analyst:

Date:
Time:
Analyst:

No Sample #2, 2 Jars of same sample Jot 3 15 05

NOTE: A Positive Response Below Mandates Additional Information on Back Page!!

	1	2	3	4
METALS, Total	[X]	[X]	[ ]	[ ]
RCRA Hazardous Waste	[X]	[X]	[ ]	[ ]
RADIOLOGICAL	[ ]	[ ]	[ ]	[ ]
SPECIFIC ORGANICS	[ ]	[ ]	[ ]	[ ]
MICROBIOLOGY	[ ]	[ ]	[ ]	[ ]
BIOASSAY/BIOTOXICITY	[ ]	[ ]	[ ]	[ ]
OTHER (Define)	~~[X]~~	~~[X]~~ K.D.B.	[ ]	[ ]

(OVER)

Analytical & Environmental Testing, Inc.

Sample Receipt Check List--Required for Reglatory Samples only!!

filename:g:\chcklist\ck_sampl.xls

Last revised: 05/24/2004

Client: Remediation Services	Project Number: 90057
Login Person: K.D.B.	

Samples received by [AET, UPS, FedEx, BUS] circle one

	YES	NO	N/A	Comments
COC Present, Correct, & Complete? (name/address,sample id, division, client type)	✓	*		
Custody Seal on Shipping Container?			✓	Not a requirement
Custody Seal on Bottles?			✓	Not a requirement
Temperature of Storage Container on COC?	✓	*		
Samples delivered on ice?	✓	*		
Samples Received Intact (none Broken)?	✓	*		
Zero Headspace VOA/TOX?		*	✓	
Correct Sample Containers?	✓	*		
Adequate Volume Provided?	✓	*		
Samples Presevered?	✓	*		
Samples received within Holding Time?	✓	*		
COC and Sample Labels Agree?	✓	*		

*** A "NO" response mandates a "Sample Condition Notification" to be either signed on dock upon delivery or faxed to the cutomer ASAP**

Public Notice

Notice is hereby given that RSL Acquisition Company LLC. does intend to submit to the Department of Environmental Quality, Office of Solid and Hazardous Waste, Solid Waste Division, an application for a Permit Renewal to operate a Beneficial Use Facility to enable application of recycled Organic Material/Fertilizer from RSL's restaurant grease trap process facility to pasture land. The RSL facility is located at 1225 Neosho Ave., Baton Rouge, LA. 70802. Currently identified application sites are in East Baton Rouge and East Feliciana Parishes west of Zachary along Highways 964 and 61. RSL is also requesting in accordance with LAC 33.VII.307 an exemption to the startup and certification requirements of LAC 33.VII.509.C

Comments concerning the facility may be filed with the secretary of the Louisiana Department of Environmental Quality at the following address:

Louisiana Department of Environmental Quality
Office of Environmental Services
Water and Waste Permits Division
P.O. Box 4313
Baton Rouge, LA. 70821-4313

3339809-June 6-1t

CAPITAL CITY PRESS

Publisher of
THE ADVOCATE

PROOF OF PUBLICATION

The hereto attached notice was published in THE ADVOCATE, a daily newspaper of general circulation published in Baton Rouge, Louisiana, and the official Journal of the State of Louisiana, the City of Baton Rouge, and the Parish of East Baton Rouge, in the following issues:

06/06/06

Susan A. Bush, Public Notices Clerk

worn and subscribed before me by the person whose signature appears above:

June 6, 2006

Pegeen Singley, Notary Public, #68565
My Commission Expires: Indefinite
Baton Rouge, Louisiana

EN DIATION SERVICES OF LA 3339809
R. HELMS
225 HO AVE
ATON ROUGE LA 70802

Public Notice

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3339809-June 6-1t

AFFIDAVIT OF PUBLICATION

State of Louisiana
Parish of: East Feliciana
Publication: The Watchman

BEFORE ME, Notary, personally came and appeared: Tammy Calhoon whom, being duly sworn, did depose and say that she is a Customer Service Representative

The Watchman

A newspaper of general publication published within the Parish of East Feliciana and that an advertisement for RSL, Public Notice Notice, was published in this newspaper's issue dated: June 15, 2006, and in the Public Notice Section, Legal Number 6665.

Tammy Calhoon
TAMMY CALHOON

SUBSCRIBED AND SWORN to before me this 15 day of June, 2006.

April Simmons
Signature of Notary

APRIL H. SIMMONS
Notary ID #79554

PUBLIC NOTICE

Notice is hereby given that RSL Acquisition Company LLC does intend to submit to the Department of Environmental Quality, Office of Solid and Hazardous Waste, Solid Waste Division, an application for a Permit renewal to operate a Beneficial Use Facility to enable application of recycled Organic Material/Fertilizer from RSL's restaurant grease trap process facility to pasture land. The RSL facility is located at 1225 Neosho Ave., Baton Rouge, LA. 70802. Currently identified application sites are in East Baton Rouge and East Feliciana Parishes west of Zachary along Highways 964 and 61. RSL is also requestion in accordance with LAC 33.VII.509.C

Comments concerning the facility may be filed with the secretary of the Louisiana Department of Environmental Quality at the following address:

Louisiana Department of Environmental Quality Office of Environmental Services
Water and Waste Permits Division
P.O. Box 4313
Baton Rouge, LA. 70821-4313

AFFIDAVIT OF PUBLICATION

State of Louisiana
Parish of: East Feliciana
Publication: The Watchman

BEFORE ME, Notary, personally came and appeared: Tammy Calhoon whom, being duly sworn, did depose and say that she is a Customer Service Representative for

The Watchman

A newspaper of general publication published within the Parish of East Feliciana and that an advertisement for RSL – Remediation Services of Louisiana, Inc "DEQ Public Notice" was published in this newspaper's issue dated: August 24, 2006, and in the Public Notice Section, Legal Number 6749.

Tammy Calhoon
TAMMY CALHOON

SUBSCRIBED AND SWORN to before me this 29th day of August, 2006.

April Simmons
Signature of Notary

APRIL H. SIMMONS
Notary ID #79554

PUBIC NOTICE
LOUISIANA DEPARTMENT OF ENVIRONMENTAL QUALITY (LDEQ)
REMEDIATION SERVICES OF LOUISIANA
RSL ACQUISITIONS COMPANY, LLC
BENEFICIAL USE APPLICATION SITES
ADMINISTRATIVE COMPLETENESS DETERMINATION

The LDEQ, Office of Environmental Services, has reviewed a solid waste permit application from Remediation Services of Louisiana - RSL Acquisitions Company, LLC, 122 Neosho Avenue, Baton Rouge, LA 70802, for the Beneficial Use Application Sites and determined that it is administratively complete. The application was received on June 06, 2006. **The facilities are located at the following application sites in East Baton Rouge Parish and East Feliciana Parish:**

Wilmer R. Mills Property (Home Place)
Three and one half miles northwest of Zachary, Louisiana on Highway 964 (East Baton Rouge Parish)

David P. Mills Property (David's Place)
Three and one half miles northwest of Zachary, Louisiana on Highway 964; (East Baton Rouge Parish)

C. O. McKerley Property (McKerley Property)
Two and one half miles West of Zachary, Louisiana on Highway964; three quarters of a mile south of Highway 64 (East Baton Rouge Parish)

Billy Kalencki Property (Billy's Place)
Seven miles northwest of Zachary, Louisiana on Highway 964 (East Feliciana Parish)

Henry Baxter Property (Baxter Farm)
On the East side of Highway 61, two miles north of the intersection of Highways 61 and 964 (East Baton Rouge Parish)

Elliot Cocoran Property (Cocoran Farm)
One and one tenth miles north northwest of the intersection of the Highway 19 and Highway 412 on Midway Road in Slaughter, Louisiana (East Feliciana Parish)

Remediation Services of Louisiana - RSL Acquisitions Company,LLC proposes to renew it's beneficial Use permit.

Inquiries or requests for additional information regarding this application should be directed to Robert Nissen, LDEQ, Environmental Assistance Division, P. O. Box 4313, Baton Rouge, LA 70821-4313 or at 225-219-3286.
Persons wishing to be included on the LDEQ permit public notice mailing list or for other public participation related questions should contact the Public Participation Group in writing at LDEQ, P.O. BOX 4313, BATON ROUGE, LA 70812-4313, by email at maillistrequest@ldeq.org, or contact the LDEQ Customer Service Center at (225) 219-LDEQ (219-5337).
Permit public notices can be viewed on the LDEQ Permits public Web page at www.deq.state.la.us/news/PubNotice/ and general information related to the public participation in permitting activities can be viewed at www.deq.louisiana.gov/portal/tabid/2198/Default.aspx.
Alternatively, individuals may elect to receive the permit public notices via email by subscribing to the LDEQ permits public notice List Server at http://www.state.la.us/ldbc/listservpage/ldeq_pn_listserv.htm.
All correspondence should specify AI Number 38086, Permit Number P-0304, and Activity Number PER20060001.

8/24/06
6749

CAPITAL CITY PRESS

Publisher of
THE ADVOCATE

PROOF OF PUBLICATION

The hereto attached notice was published in THE ADVOCATE, a daily newspaper of general circulation published in Baton Rouge, Louisiana, and the official Journal of the State of Louisiana, the City of Baton Rouge, and the Parish of East Baton Rouge, in the following issues:

08/23/06

S A Bush

Susan A. Bush, Public Notices Clerk

Sworn and subscribed before me by the person whose signature appears above:

August 23, 2006

Pegeen Singley

Pegeen Singley, Notary Public, #65565
My Commission Expires: Indefinite
Baton Rouge, Louisiana

PUBLIC NOTICE
LOUISIANA DEPARTMENT OF ENVIRONME
REMEDIATION SERVICES OF L
RSL ACQUISITIONS COMPA
BENEFICIAL USE APPLICATI
ADMINISTRATIVE COMPLETENESS I

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Seven miles northwest of Zachary, Louisiana on Hwy. 964

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On the East side of Highway 61, two miles north of the in 964 (East Baton Rouge Parish)

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Remediation Services of Louisiana - RSL Acquisitions Comp Beneficial Use permit.

Inquiries or requests for additional information regarding this Robert Nissen, LDEQ, Environmental Assistance Division, F 7082 1-43 1 3 or at 225-219-3286.

Persons wishing to be included on the LDEQ permit public no participation related questions should contact the Public F LDEQ, P.O Box 4313, Baton Rouge, LA 70821-4313, by em contact the LDEQ Customer Service Center at (225) 219-LDE

Permit public notices can be viewed on the LDEQ Permits pu la.us/news/PubNotice/ and general information related to the activities can be viewed at www.deq.louisiana.gov/portal/tab Alternatively, individuals may elect to receive the permit public to the LDEQ permits public notic http://www.state.la.us/ldbc/listservpage/ldeq_pn_listserv.htm

All correspondence should specify AI Number 38086, Perm Number PER20060001.

3396559-aug 23-1t

REMEDIATION SERVICES OF LA	3396559
BRIAN HELMS	
1225 NEOSHO AVE	
BATON ROUGE LA 70802	

[TAL CITY PRESS

Publisher of
THE ADVOCATE

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tl arish of East Baton Rouge,
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08/23/06

n A. Bush, Public Notices Clerk

and subscribed before me by the
n whose signature appears above:.

August 23, 2006

Singley, Notary Public, #65565
ommission Expires: Indefinite
Baton Rouge, Louisiana

PUBLIC NOTICE
LOUISIANA DEPARTMENT OF ENVIRONMENTAL QUALITY (LDEQ)
REMEDIATION SERVICES OF LOUISIANA -
RSL ACQUISITIONS COMPANY, LLC
BENEFICIAL USE APPLICATION SITES
ADMINISTRATIVE COMPLETENESS DETERMINATION

The LDEQ, Office of Environmental Services, has reviewed a solid waste permit application from Remediation Services of Louisiana - RSL Acquisitions Company, LLC, 1225 Neosho Avenue, Baton Rouge, LA 70802 for the Beneficial Use Application Sites and determined that it is administratively complete. The application was received on June 06, 2006. **The facilities are located at the following application sites in East Baton Rouge Parish and East Feliciana Parish.:**

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Three and one half miles northwest of Zachary, Louisiana on Highway 964 (East Baton Rouge Parish)

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Remediation Services of Louisiana - RSL Acquisitions Company, LLC - proposes to renew its Beneficial Use permit.

Inquiries or requests for additional information regarding this application should be directed to Robert Nissen, LDEQ, Environmental Assistance Division, P. O. Box 4313, Baton Rouge, LA 70821-4313 or at 225-219-3286.

Persons wishing to be included on the LDEQ permit public notice mailing list or for other public participation related questions should contact the Public Participation Group in writing at LDEQ, P.O. Box 4313, Baton Rouge, LA 70821-4313, by email at maillistrequest@ldeq.org or contact the LDEQ Customer Service Center at (225) 219-LDEQ (219-5337).

Permit public notices can be viewed on the LDEQ Permits public Web page at www.deq.state.la.us/news/PubNotice/ and general information related to the public participation in permitting activities can be viewed at www.deq.louisiana.gov/portal/tabid/2198/Default.aspx.
Alternatively, individuals may elect to receive the permit public notices via email by subscribing to the LDEQ permits public notice List Server at http://www.state.la.us/ldbc/listservpage/ldeq_pn_listserv.htm.

All correspondence should specify AI Number 38086, Permit Number P-0304, and Activity Number PER20060001.

3396559-aug 23-1t

Media Type (check one)
Hazardous Waste ☐ Air ☐
Solid Waste ☒ Water ☐
Radiation Licensing ☐

Agency Interest Number: 38086
Is this a copy of a previously submitted form? Yes ☐ No ☒
If yes, indicate the original submittal date: _____
If yes, indicate the original permit number: _____

Department of Environmental Quality Permits Division P.O. Box 4313 Baton Rouge, LA 70821-4313 (225) 219-3181	**Addendum to Permit Applications per LAC 33:I.1701**	LDEQ

Please Type Or Print	Company Name: RSL Acquisition Company LLC	☒ Owner ☐ Operator	For Permits Division Use Only
	Parent Company (if Company Name given above is a division): /		
	Plant name (if any)		
	Nearest town: Baton Rouge	Parish where located: East Baton Rouge	

1. Does the company or owner have federal or state environmental permits identical to, or of a similar nature to, the permit for which you are applying in other states? (This requirement applies to all individuals, partnerships, corporations, or other entities who own a controlling interest of 50% or more in your company, or who participate in the environmental management of the facility for an entity applying for the permit or an ownership interest in the permit.)

   ☐ Permits in Louisiana. List Permit Numbers: No

   ☐ Permits in other states (list states): None

2. Do you owe any outstanding fees or final penalties to the Department? No☒ Yes☐
   If yes, please explain. ______

3. Is your company a corporation or limited liability company? No☐ Yes☒ If yes, attach a copy of your company's Certificate of Registration and/or Certificate of Good Standing from the Secretary of State.

Certification:
I certify, under provisions in Louisiana and United States law which provide criminal penalties for false statements, that based on information and belief formed after reasonable inquiry, the statements and information contained in this Addendum to the Permit Application, including all attachments thereto are true, accurate, and complete.

Responsible Official

Name: Brian R Helms	City: Baton Rouge · State: LA · Zip: 70802
Title: Engineer	Business phone: 225.389.0804
Company: RSL Acquisition Company LLC	Signature of responsible official(s): [signature]
Suite, mail drop, or division	Date: June 26 2006
Street or P.O. Box: 1225 Neosho Ave	

form_7037_r03
06/30/04

United States of America
State of Louisiana

As Secretary of State, Al Ater, I do hereby Certify that

RSL ACQUISITION COMPANY, LLC

A limited liability company domiciled in KENNER, LOUISIANA,

Filed charter and qualified to do business in this State on August 2, 2005,

I further certify that the records of this Office indicate the company has paid all fees due the Secretary of State, and so far as the Office of the Secretary of State is concerned, is in good standing and is authorized to do business in this State.

I further certify that this certificate is not intended to reflect the financial condition of this company since this information is not available from the records of this Office.

In testimony whereof, I have hereunto set
My hand and caused the Seal of my Office
To be affixed at the City of Baton Rouge on,
June 9, 2006

Secretary of State
35991048K

Certificate ID: 20060609003254

To validate this certificate, visit the following web site, go to **Commercial Division, Validate Certificate**, then follow the instructions displayed.
www.sos.louisiana.gov